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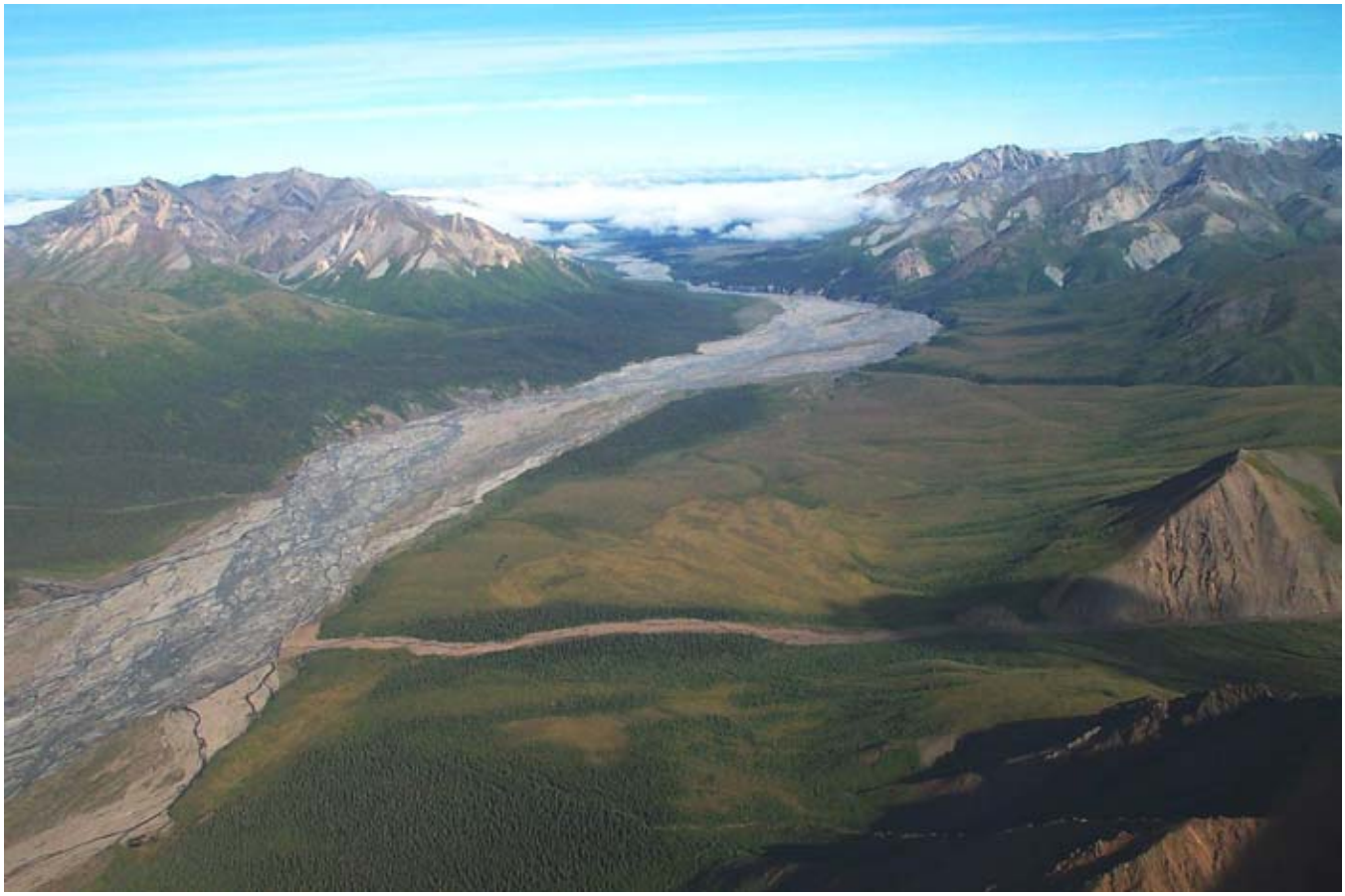
Land Resource Regions and Major Land Resource Areas of Alaska



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Cover
Looking north along the Toklat River in Denali National Park with the Wyoming Hills in the background. This area is within the Interior Alaska Mountains Major Land Resource Area (228), a part of the Interior Alaska Major Land Resource Region (X1).

Contents

Introduction

Land resource regions (LRRs) and major land resource areas (MLRAs) for the contiguous forty-eight states were mapped and described for the first time in the early 1960s and in 1965 the USDA published Agriculture Handbook No. 296, *Land Resource Regions and Major Land Resource Areas of the United States*. In the mid-1970s, the classification for LRRs and MLRAs was revised and updated and in 1981 the Handbook was reissued (USDA 1981). The 1981 revision of the Handbook also included, for the first time, land resource regions and major land resource areas for Alaska, Hawaii, and the territory of Puerto Rico. In 2000, the Natural Resource Conservation Service (NRCS) initiated a second revision of the Handbook to further refine and update the LRR and MLRA delineations and descriptions. NRCS plans to publish the second revision some time in 2005 or 2006. This document is intended as an interim product to provide updated maps and descriptions, pending publication of the revised Agriculture Handbook No. 296.

The updated maps and descriptions of the LRRs and MLRAs for Alaska represent a new, mostly original, classification. In this new classification, Alaska has been stratified into five LRRs (compared to three in the 1981 classification) and 27 MLRAs (compared to the original 15). LRRs are intended to represent areas of broad regional climate and climatic conditions, patterns, and processes. Within an LRR, origin and pattern of weather systems and indicators of regional climate are relatively consistent. Permafrost zones and vegetation formations are examples of indicators of regional climate. MLRAs are intended to represent areas of subregional physiographic and geomorphic patterns and processes and general vegetation potentials. Within an MLRA there are relatively consistent patterns and kinds of landforms, soils, surficial geologic and soil parent materials; geomorphic and soil forming processes; and predominant vegetation types and structure. MLRA names include the geographic location and predominant physiography. Most MLRAs are predominantly a single physiographic type (e.g., mountains or lowlands). A few have mixed physiography (e.g., hills and valleys) (*Figure* 1). See Table 1 for a list of LRRs and MLRAs and their extent.

The primary differentiating criteria used to delineate and describe the LRRs and MLRAs were climatic, physiographic, biologic, and ecologic features, properties, and relationships. Current land use was not considered. Current and potential land uses and appropriate resource management systems are closely associated with LRRs and MLRAs to the extent that resource patterns and conditions affect land use and management.

Table 1. Area and Proportionate Extent of Land Resource Regions and Major Land Resource Areas of Alaska.

Land Resource Region	Acres	Hectares	Pct.	Major Land Resource Area	Acres	Hectares	Pct.
W1—Southern Alaska	60,733,423	24,588,430	16.3	220—Alexander Archipelago-Gulf of Alaska Coast	17,340,899	7,020,607	4.7
				221—Kodiak Archipelago	3,182,450	1,288,441	0.9
				222—Southern Alaska Coastal Mountains	16,833,093	6,815,017	4.5
				223—Cook Inlet Mountains	12,635,131	5,115,438	3.4
				224—Cook Inlet Lowlands	6,810,875	2,757,439	1.8
				225—Southern Alaska Peninsula Mountains	3,930,975	1,591,488	1.1
W2—Aleutian Alaska	6,815,007	2,759,112	1.8	226—Aleutian Islands-Western Alaska Peninsula	6,815,007	2,759,112	1.8
X1—Interior Alaska	166,149,500	67,267,005	44.6	227—Copper River Basin	2,942,433	1,191,268	0.8
				228—Interior Alaska Mountains	28,437,017	11,512,962	7.6
				229—Interior Alaska Lowlands	23,272,692	9,422,143	6.2
				230—Yukon-Kuskokwim Highlands	38,355,340	15,528,478	10.3
				231—Interior Alaska Highlands	44,344,456	17,953,221	11.8
				232—Yukon Flats Lowlands	8,192,473	3,316,791	2.2
				233—Upper Kobuk and Koyukuk Hills and Valleys	8,272,674	3,349,261	2.2
				234—Interior Brooks Range Mountains	12,332,415	4,992,881	3.3
X2—Western Alaska	58,550,600	23,704,696	15.7	235—Northern Alaska Peninsula Mountains	3,663,179	1,483,068	1.0
				236—Bristol Bay-Northern Alaska Peninsula Lowlands	12,571,116	5,089,521	3.4
				237—Ahklun Mountains	9,307,460	3,768,202	2.5
				238—Yukon-Kuskokwim Coastal Plain	19,237,051	7,788,280	5.2
				239—Northern Bering Sea Islands	2,296,964	929,945	0.6
				240—Nulato Hills-Southern Seward Peninsula Highlands	11,474,830	4,645,680	3.1
Y—Northern Alaska	80,373,304	32,539,800	21.6	241—Seward Peninsula Highlands	8,705,951	3,524,677	2.3
				242—Northern Seward Peninsula-Selawik Lowlands	5,079,048	2,056,295	1.4
				243—Western Brooks Range Mountains, Foothills, and Valleys	14,780,981	5,984,203	4.0
				244—Northern Brooks Range Mountains	10,060,206	4,072,958	2.7
				245—Arctic Foothills	27,094,339	10,969,368	7.3
				246—Arctic Coastal Plain	14,652,779	5,932,299	3.9
	372,621,834	150,859,043	100.0				

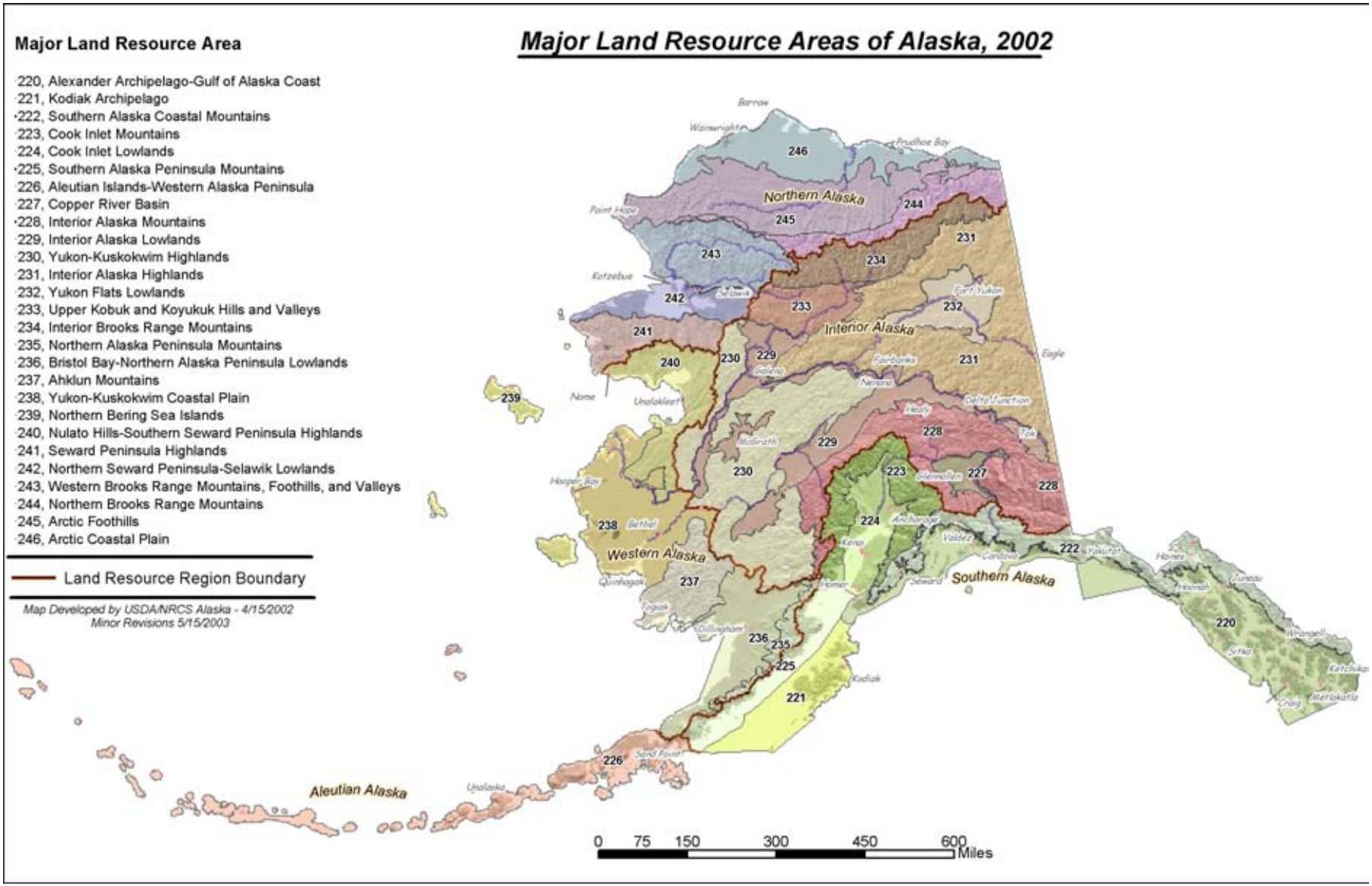

Figure 1. Land Resource Regions and Major Land Resource Areas.

W1—Southern Alaska Region

This region includes the arc of coastal lowlands and mountains along the Gulf of Alaska from the Alexander Archipelago in the southeast to Kodiak Island and the southern portion of the Alaska Peninsula in the west (*Figure* 1). It also includes the lowlands and mountains of Cook Inlet. All rivers in this region drain into the Gulf of Alaska and North Pacific. Elevation ranges from sea level, along the coast, to 20,320 feet (6,195 meters), at the summit of Mount McKinley. The region makes up 24,588,430 square kilometers.

Land use is very diverse and includes urban and rural development, agriculture, forestry, commercial fishing, mining, livestock grazing, subsistence hunting and fishing, recreation, and wildlife habitat. The climate varies from maritime, at lower elevations along the coast, to transitional maritime-continental, at higher elevations and in the northern Cook Inlet Lowlands. The annual precipitation ranges from about 15 inches (380 millimeters) in the central Cook Inlet Lowlands, to over 275 inches (7,000 millimeters), in the coastal mountains. The average annual snowfall ranges from 30 to 70 inches (76 to 178 centimeters) along the coast, to as much as 800 inches (2,032 centimeters) in the high mountains. The annual air temperature ranges from 27 to 46 degrees F (-.8 to 7.8 degrees C), with average temperatures warmer near the coast and in the Cook Inlet Basin. Daily and seasonal temperature variations are highest in the mountains. The frost-free period ranges from less than 60 days to more than 140 days.

The higher elevations consist of rugged mountains with bare rock, talus, glaciers, and ice fields. Rolling hills, glacial moraines, alluvial fans, and large outwash plains extend from the mountains to

the often-rugged coastline. Broad flood plains, terraces, and deltas flank the numerous glacial and freshwater drainages. Some permafrost occurs in the northern portion of the region in small isolated depressions and on north-facing slopes.

Cryepts occur on steep mountain slopes. At higher elevations, these soils have pergelic temperature regimes, although most lack permafrost in the profile. The lower slopes, foothills, and moraines have Cryods, Cryands, Aquands, and Cryepts. While Spodosols and Andisols intergrade in some areas, Andisols dominate in areas closer to volcanic sources. These areas include the Alaska Peninsula, Kodiak Island, southern Kenai Peninsula, Kruzof Island, and Baranof Island. The Cryepts on the younger surfaces include Eutrocryepts and Dystrocryepts. Fluvents and Aquents dominate flood plains and low terraces. Histosols and Histic subgroups of other orders occur throughout the region on level and depressional landforms, and even on steeper slopes along the coast and in the southeast. Histosols include Fibrists, Hemists, Saprists, and Folists.

Alpine and sub-alpine vegetation is present on the mountain slopes. Moving downslope, the vegetation transitions into sub-alpine grasslands and tall scrub. The lower elevations of the Cook Inlet Lowlands have mixed forests of white spruce, black spruce, paper birch, and willow. Stunted black spruce grades into scrub and herbaceous communities in fens and bogs. Coastal forests dominated by Sitka spruce are along the north and northwest portions of the Gulf of Alaska. Western hemlock and Sitka spruce forests dominate in the southeast portion of the region, with red cedar and Alaska cedar present in the area farthest south.

220—Alexander Archipelago-Gulf of Alaska Coast

Introduction

MLRA 220 is in the Southern Region of Alaska. It includes the narrow arc of islands and low coastal mountains from the Alexander Archipelago in southeast Alaska, north and west along the coast of the Gulf of Alaska and Prince William Sound, to the southern tip of the Kenai Peninsula (*Figure* 1). This MLRA makes up about 7,020,607 square kilometers. MLRA 220 includes the Municipality of Juneau, Alaska's capital, and a number of smaller coastal towns and villages. Federally administered lands within this MLRA include Admiralty Island National Monument and part of Misty Fjords National Monument, Tongass National Forest, Chugach National Forest, and Glacier Bay, Wrangell-St. Elias, and Kenai Fjords National Parks and Preserves. The southern terminus of the Trans-Alaska Pipeline is in Valdez.

Physiography

This area lies within the Pacific Border Ranges, Coastal Mountains, and Coastal Trough physiographic provinces of the Pacific Mountain system (Wahrhaftig 1965). In the Alexander Archipelago, Prince William Sound, and the southern Kenai Peninsula the terrain is predominantly low to moderate relief, deeply incised mountains. Throughout the area glaciers, rivers, and streams have cut deep, narrow to broad valleys. In the broader valleys there are nearly level to strongly sloping flood plains and stream terraces. Alluvial and colluvial fans and short footslopes are common in the valleys along the base of the mountains. Rocky headlands and sea cliffs are common along the coast. In the central portion of the area the terrain consists primarily of strongly sloping to moderately steep outwash plains, alluvial fans, long footslopes, and floodplains. Formed by melt waters of glaciers and icefields from the adjoining Southern Alaska Coastal Mountains (MLRA 222), flood plains in this portion of the area are generally broad, high gradient, and braided. Elevation ranges from sea level to 4,667 feet (1,422 meters).

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: South Central Alaska (1905), 25 percent and Southeast Alaska (1906), 75 percent. This MLRA drains to the Gulf of Alaska and the North Pacific by way of numerous short, high gradient rivers that originate from glaciers, ice fields, mountain uplands, and the interior of Alaska and British Columbia. Major rivers include the Copper, Alsek, Taku, and Stikine Rivers. Lakes make up less than two percent of the area. Glaciers make up less than one percent of the area and are limited to higher elevations on Baranof Island in the Alexander Archipelago.

Geology

During the late Pleistocene epoch, the entire area was covered with glacial ice. The numerous fjords of the Alexander Archipelago and Prince William Sound were formed along faults or joints, chiefly as a result of glacial scouring and deepening of preglacial river valleys. Most glacial deposits have been eroded away or buried by mountain colluvium and alluvium, which covers about 90 percent of the present landscape. Remaining glacial and glaciofluvial deposits are generally restricted to coastal areas. A layer of volcanic ash of varying thickness was deposited on much of the landscape in the southeast and northwest portions of the area during the Holocene epoch from volcanic activity within and adjacent to the area. Underlying much of the area, and exposed at the surface on steep mountain slopes and ridges, are Paleozoic, Mesozoic, and Lower Tertiary stratified sedimentary rocks and Cretaceous and Tertiary intrusive rocks.

Climate

Cloudy skies, moderate temperatures, and abundant rainfall characterize the temperate maritime climate of this area. Winter storms, accompanied by heavy rainfall at lower elevations and snow at higher elevations, are frequent. Moderate to strong, south and southeast winds are common before and during storms. The average annual precipitation is 25 to 200 inches (635 to 5,080 millimeters). The average annual snowfall ranges from about 30 to 70 inches (76 to 178 centimeters) along the coast, to as much as 200 inches (508 centimeters) at higher elevations. The average annual temperature at lower elevations ranges from about 37 degrees F (2.7 degrees C) in the northwest, to 46 degrees F (7.7 degrees C) in the southeast. The average frost-free period is about 120 to 190 days.

Soils

The approximate extent of the soil orders and nonsoil areas in this MLRA is as follows: Spodosols, 37 percent; Histosols, 33 percent; Entisols, 6 percent; other soil orders, 1 percent; and miscellaneous (nonsoil) areas, 23 percent. Area soils have a cryic soil temperature regime, most have a udic soil moisture regime, and mixed mineralogy. Some Humicryods (Partofshikof and Sitka series) on mountains and hills are formed in silty volcanic ash over loamy and gravelly or cobbly colluvium and glacial till. Other Humicryods (Tolstoi and Kupreanof series) and Haplocryods (Remedios series), also on mountains and hills, are formed in colluvium and glacial till. These Spodosols range from shallow to deep and from well drained to somewhat poorly drained. Cryosaprists (Maybeso series), Cryohemists (Kina series), and Cryofibrists (Staney series) on footslopes, discharge slopes, valley floors, and in areas immediately above timberline are formed in thick organic materials. These soils are generally deep and are poorly drained or very poorly drained. Cryofolists (McGilvery series) are on steep mountainsides and are well drained. Cryaquents (Ashmun series) and Cryofluvents (Tonowek series) on floodplains, stream terraces, and outwash plains are formed in silty, sandy, and gravelly to cobbly alluvium. These soils are generally deep and range from well drained to somewhat poorly drained. Common miscellaneous areas include surface bedrock, talus, tidal flats, beaches, riverwash, and water.

Biological Resources

This MLRA primarily includes the lower elevation forested and subalpine zones. Western hemlock and Sitka spruce are the dominant vegetation on mountains and hills at lower elevations. Red cedar and Alaska cedar become more prevalent in the south of the area. Black cottonwood and mixed forest types occur on flood plains. Peatlands and other sites too wet for forest growth support sedge-grass meadows and low scrub. Tall alder scrub is on steep mountain slopes and in the subalpine zone. Bluejoint reedgrass grasslands are also common in the subalpine zone. Dwarf alpine scrub, herbaceous communities, and barren ground dominate the landscape above about 2,500 to 3,000 feet (762 to 914 meters) elevation.

Some of the major mammal species of the area are brown bear, black bear, Sitka black-tailed deer, moose, wolf, and mountain goat. Many species of migratory waterfowl and shorebirds pass through the MLRA. Extensive coastal meadows in the Yakutat area are especially important as resting and feeding sites during migration. Peregrine falcons and bald eagles nest in the area. Southeast Alaska supports the largest concentration of bald eagles in the world. Area streams and rivers support healthy populations of wild salmon and fresh water fish.

Land Use

For many decades, logging, commercial fishing, and mining have been the primary industrial land uses throughout much of the area. In recent years, changes in public interests, land use policies, and timber economics have contributed to a significant decline in the timber industry. Commercial fishing continues to be an important industry and most communities support a fleet of boats and fishing related facilities. A number of mines operate in the area and others have been prospected and proposed. Tourism and wildland recreation are becoming increasingly important within the MLRA. During the summer, one or more cruise ships are likely to be docked in Juneau and other ports in the area. Flight-seeing, guided fishing, and other recreational tours are available out of Juneau and other major communities. Juneau and a number of smaller communities are experiencing significant growth and urban development. Subsistence hunting, fishing, and gathering provide food and a variety of other resources to local residents and remain the principal economy for residents of remote villages.

The major soil resource management concerns are erosion and mass wasting. Mass wasting induced by earthquakes and erosion can take the form of creep, earthflow, rockfall, slump, debris avalanche, and debris flow. Undercutting or overloading slopes, vibrations from earthquakes, and increased soil moisture content can trigger mass movements. Mass wasting can be a natural phenomenon or caused by activities such as logging and road construction.

221—Kodiak Archipelago

Introduction

MLRA 221 is in the Southern Region of Alaska. It includes Kodiak Island, Afognak Island, and nearby islands in the western Gulf of Alaska (*Figure* 1). This MLRA makes up about 1,288,441 square kilometers. For the most part, the area is undeveloped wildland and is sparsely populated. The principal community is the city of Kodiak. Along the coast are a number of small villages. The only roads are in and around the city of Kodiak and along nearby coastal areas. Federally administered lands within this MLRA include the Kodiak National Wildlife Refuge and a small part of Chugach National Forest.

Physiography

This area lies within the Pacific Border Ranges physiographic province of the Pacific Mountain system (Wahrhaftig 1965). The terrain of the area is low to moderately high, rolling mountains. Broad, nearly level valleys bordered by low rolling hills are common at lower elevations. The complex, irregular coastline has many prominent headlands, sea cliffs, and narrow, steep-walled bays. Elevation ranges from sea level, along the coast, to 4,405 feet (1,343 meters), at the summit of Mt. Glottof near the center of Kodiak Island.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: South Central Alaska (1905), 100 percent. The area is drained into the Shelikof Strait and the Pacific Ocean by a number of short rivers and streams originating in the the mountainous uplands. Major rivers includes the Karluk and Uganik Rivers on Kodiak Island. The largest lakes in the area include Karluk, Frazer, and Red Lakes on Kodiak Island. Numerous small to medium-sized lakes are in coastal lowlands and the bottoms of broad river valleys. Lakes make up about 2 percent of the area.

Geology

During the middle to late Pleistocene epoch, all of Kodiak Archipelago was covered by glacial ice originating in the mountains of the Alaska Peninsula and extending 50 to 100 miles (80 to 160 kilometers) or more into the North Pacific. No glaciers remain today. During the Holocene epoch, colluvium and slope alluvium accumulated across about 85 percent of the present day landscape. Lightly modified glacial moraines and drift are on hills, lower elevation valleys, and on coastal plains. Most of the present landscape is blanketed in a moderately thick to thick layer of ash, which originated from volcanoes on the Alaska Peninsula. The 1912 eruption of Mt. Novarupta deposited 1 to 2 feet (30 to 60 centimeters) of ash on the northern half of the islands. Kodiak Island and the adjacent islands are underlain primarily by Cretaceous and Lower Tertiary stratified sedimentary rocks. Older marine sedimentary and volcanic rocks occur locally. The Trinity Islands and southeast coast of Kodiak Island were formed in younger Tertiary marine and continental rocks. This MLRA is in a seismically active zone. Faults extend the length of the major islands. Land subsidence at Kodiak Island, as a result of the 1964 Good Friday earthquake, has been estimated at 5.4 feet (1.6 meters).

Climate

Cloudy conditions, moderate temperatures, and abundant rainfall characterize the temperate maritime climate of this area. The average annual precipitation is 23 to 98 inches (58 to 249 millimeters). The average annual snowfall ranges from about 30 inches (76 centimeters) in the southwest to 100 inches (254 centimeters) in the northeast and at higher elevations. The average

annual temperature ranges from 40 to 44 degrees F (4.5 to 6.7 degrees C). At lower elevations, the average frost-free period ranges from about 85 to 200 days.

Soils

The approximate extent of the soil orders and nonsoil areas in this MLRA is as follows: Andisols, 75 percent; Histosols, 5 percent; Inceptisols, 1 percent; other soil orders, 1 percent; and miscellaneous (nonsoil) areas, 18 percent. Area soils have a cryic soil temperature regime, a udic or aquic soil moisture regime, and mixed mineralogy. Haplocryands and Vitricryands (Kodiak and Pyramid series), on mountain slopes and hills, are formed in silty volcanic ash over loamy and gravelly glacial till or bedrock residuum. These soils range from shallow to deep and are well drained. Cryaquepts (Ugak and Pasagshak series), in broad valley bottoms and glacially scoured depressions, are formed in silty volcanic ash over loamy and gravelly glacial till and colluvium. The soils are mostly deep and somewhat poorly drained. Cryofibrists (Saltery series), also in broad valley bottoms and depressions, are formed in thick organic deposits. These soils are somewhat poorly drained to very poorly drained. Common miscellaneous areas include surface bedrock, rock escarpments, talus, riverwash, tidal flats, and beaches.

Biological Resources

At lower elevations, uplands of the northeastern portion of this area are dominated by Sitka spruce forests. To the south, the forests gradually give way to tall alder scrub and bluejoint reedgrass grasslands. On flood plains, there are black cottonwood and mixed spruce-cottonwood forests, tall and low willow scrub, tall alder scrub, and various herbaceous plant communities. At higher elevations and on Chirikof, Trinity, and Semidi Islands the vegetation is composed of dwarf scrub and herbaceous communities.

Some of the major mammal species of the area are Kodiak brown bear, Sitka black-tailed deer, Roosevelt elk, and mountain goat. Many species of waterfowl migrate through, breed or winter in the area. There is a major migration route through Shelikof Strait and along the Alaska Peninsula. The coasts provide important wintering habitat for scoters, eiders, oldsquaws, mallards, and black brant. Other waterfowl in the area include loons, geese, ducks, and grebes. The rocky shorelines are excellent habitat for bald eagles, and peregrine falcons. The area also includes many major seabird colonies. Area streams and rivers support healthy populations of wild salmon and fresh water fish.

Land Use

Commercial fishing and fish processing are the primary industrial uses of the area. Most communities support a fleet of boats and fishing related facilities. Logging in the northeast portion of the area provides raw materials for a small-scale wood products industry. A number of cattle, bison, and game ranches operate in the area and produce meat and other products for local consumption. Tourism and wildland recreation are becoming increasingly important within the MLRA. During the summer, cruise ships are likely to be docked in the city of Kodiak. A number of local companies provide flight-seeing, guided fishing and hunting, and a variety of other recreational tours. The Kodiak Islands are world famous for the huge Kodiak brown bears that inhabit them. Brown bears and other local game species attract visitors from around the world for hunting and wildlife viewing. Subsistence hunting, fishing, and gathering provide food and a variety of other resources to local residents and continues to be the principal economy in many villages.

The major soil resource management concerns relate to erodibility of soils on steep slopes and slope failures. Slope failures can be either naturally occurring or accelerated by human activity. Maintaining good vegetative cover on slopes can minimize erosion.

222—Southern Alaska Coastal Mountains

Introduction

MLRA 222 is in the Southern Region of Alaska. It includes the higher elevations of the Coast, St. Elias, Chugach, and Kenai Mountains (*Figure* 1). This MLRA makes up about 6,815,017 square kilometers. The area is almost entirely undeveloped wildlands. Small, rural communities along the road system are the only permanent settlements. Federally administered land within this MLRA includes part of the Wrangell-St. Elias Bay National Park and Preserve, Glacier Bay National Park and Preserve, Misty Fjords National Monument, Chugach National Forest, and the Tongass National Forest.

Physiography

This area lies within the Coast Mountains and Pacific Border Ranges physiographic provinces of the Pacific Mountain system (Wahrhaftig 1965). The terrain throughout consists of steep, rugged, high relief mountains, massive glaciers, and ice fields. Glaciers and ice fields make up about 54 percent of the area. Throughout the ice fields are numerous aretes and nunataks. Medial and lateral moraines are common in glaciers. Unglaciated areas are deeply incised with narrow to broad valleys. Flood plains and stream terraces on valley floors rapidly give rise to steep alluvial fans and mountain footslopes. Elevation ranges from sea level, at the base of tidewater glaciers and ice fields, to 18,008 feet (5,489 meters), at the summit of Mt. St. Elias.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: South Central Alaska (1905), 30 percent and Southeast Alaska (1906), 70 percent. This MLRA drains to the Gulf of Alaska and North Pacific by way of numerous short, high gradient rivers that originate in the glaciers, ice fields, and mountainous uplands. Lakes make up less than 1 percent of the area.

Geology

During the Pleistocene epoch, the area was covered with glacial ice. Most glacial deposits have eroded away or been buried by colluvium and slope alluvium, which covers more than 90 percent of the present unglaciated landscape. Remaining glacial and glaciofluvial deposits and recent fluvial deposits are generally restricted to the bottoms of larger valleys. Underlying much of the area, and exposed at the surface on steep mountain slopes and ridges, are Paleozoic, Mesozoic, and Lower Tertiary stratified sedimentary rocks and occasionally Paleozoic intrusive rocks.

Climate

Cloudy conditions and moderate to cold temperatures characterize the climate of this area. Precipitation is usually abundant throughout the year. Snowfall in winter is tremendous and greatly exceeds annual melt in many places, as evidenced by the abundance and extent of glaciers and ice fields. The average annual precipitation throughout most of the area is 250 inches (6,350 millimeters) or greater. The average annual snowfall ranges from about 200 to 800 inches (508 to 2,032 centimeters). The average annual temperature and length of the frost-free season is not known. At higher elevations, freezing temperatures are likely to occur during any month of the year.

Soils

The approximate extent of the soil orders and nonsoil areas in this MLRA is as follows: Spodosols, 5 percent; Histosols, 2 percent; other soil orders, 3 percent, and miscellaneous (nonsoil) areas, 90 percent. Area soils have a cryic or pergelic soil temperature regime, a udic or aquic soil moisture regime, and mixed mineralogy. Humicryods (Nonwalek and Tutka series) and Haplocryods on mountains and hills are formed in loamy and gravelly colluvium and glacial till. These soils range from shallow to deep and from well drained to somewhat poorly drained. Cryosaprists, Cryohemists (Koyuktolik and Nuka series), and Cryofibrists on footslopes, discharge slopes, and valley floors are formed in thick organic materials. These soils are generally deep and somewhat poorly drained to very poorly drained. Common miscellaneous areas include surface bedrock, rubble fields, talus, and permanent ice and snow.

Biological Resources

Most of this MLRA lies within the true alpine zone. Vegetation consists of a variety of dwarf scrub and herbaceous communities. Low willow scrub is common in drainages. Lichens, scattered herbs, and dwarf shrubs dominate bedrock exposures and very shallow soils. In general, there is little or no plant growth above about 7,500 feet (2,286 meters) elevation. Along the boundary with MLRA 220, there are stringers and inclusions of tall alder scrub and bluejoint reedgrass grassland, characteristic of the subalpine zone.

Some of the major mammal species of the area include brown bear, Dall sheep, mountain goat, moose, wolf, coyote, fox, snowshoe hare, arctic ground squirrel, and hoary marmot. Ptarmigan, American golden plovers, golden eagles, and a wide variety of other birds are common in many places.

Land Use

Remote wildland recreation is the principal land use. The rugged, high mountains, extensive glaciers and ice fields, and wilderness qualities of the area attract visitors from around the world. Most visitors are served by air taxi, guiding, and outfitting companies operating out of major Alaska communities.

223—Cook Inlet Mountains

Introduction

MLRA 223 is in the Southern Region of Alaska. It includes the higher mountains of the Aleutian and Alaska Ranges and Talkeetna, Kenai, and Chugach Mountains that drain into the Cook Inlet Lowlands (MLRA 224) and Cook Inlet (*Figure* 1). This MLRA makes up about 5,115,438 square kilometers. The area is primarily undeveloped wildlands and is sparsely populated. A number of small communities, the largest of which is Cantwell, are located along the road system. Federally administered lands within this MLRA include parts of Denali National Park and Preserve, Lake Clark National Park and Preserve, Kenai National Wildlife Refuge, and Chugach National Forest.

Physiography

The Alaska and Aleutian Ranges portion of this area lies within the Alaska-Aleutian physiographic province. The Kenai and Chugach Mountains portion lies within the Pacific Border Ranges province. The Talkeetna Mountains portion lies within the Coastal Trough province. All of these provinces are within the Pacific Mountain physiographic system (Wahrhaftig 1965). The terrain throughout consists primarily of rugged, moderate to high mountains. Massive valley glaciers and ice fields are prominent at upper elevations. Many of the larger valley glaciers extend down to about 1,000 feet (305 meters) elevation and into the upper edge of the Cook Inlet Lowlands (MLRA 224). Glaciers and ice fields make up about 15 percent of the area. Throughout, the mountains are deeply incised with narrow to broad valleys with braided, high-gradient flood plains. Coalescing alluvial fans and long footslopes are common features on lower mountain slopes in broad valleys. Elevation ranges from about 2,500 feet (760 meters), along the boundary with the Cook Inlet Lowlands (MLRA 224), to 20,320 feet (6,195 meters), at the summit of Mt. McKinely.
Also included in this MLRA are small areas along the Turnagain Arm of Cook Inlet where elevations extend down to sea level.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: South Central Alaska (1905), 100 percent. All rivers in this MLRA drain into the Cook Inlet Lowlands (MLRA 224) and Cook Inlet. The Matanuska, Little Susitna, Knik, Kenai, and Chakachatna Rivers and major tributaries of the Susitna River, including the Yentna, Skwenta, Chulitna, Talkeetna, and Kashwitna Rivers originate from glaciers and mountainous uplands in the area. The largest lakes in the area include Chakachamna and Chelatna Lakes in the Alaska Range and Eklutna and Kenai Lakes in the Chugach Mountains. Lakes make up about 2 percent of the area.

Geology

The entire area, except for the highest peaks and steep upper elevation ridges, was covered in glacial ice during the late Pleistocene epoch. Most glacial deposits have eroded away or been buried by colluvium and slope alluvium during the Holocene epoch. Colluvial and alluvial deposits cover about 65 percent of the present landscape. Lightly to highly modified glacial moraines and outwash deposits are extensive on lower mountain slopes and in valleys at lower elevations. Holocene eolian deposits, consisting of an admixture of loess and volcanic ash and ranging in thickness from a few to 24 inches (60 centimeters) or more, have accumulated on mid to lower mountain slopes. Valley bottoms are buried in recent fluvial deposits. Bedrock geology consists primarily of late Paleozoic and early Mesozoic stratified sedimentary rocks. Tertiary intrusive rocks are common.

Climate

Cloudy conditions, short summers, and moderate to cold temperatures characterize the climate of this area. The average annual precipitation ranges from about 15 to 30 inches (381 to 762 millimeters) along the boundary with the Cook Inlet Lowlands (MLRA 224) to more than 100 inches (2,540 millimeters) in the highest mountains. Later summer and fall are generally the rainiest months. The average annual snowfall ranges from about 80 to 400 inches (203 to 1,016 centimeters) or more. The average annual temperature at Puntilla Lake in the Alaska Range is 27 degrees F (-2.8 degrees C). The average frost-free period is about 60 to 80 days. At higher elevations, freezing temperatures can occur during every month.

Soils

The approximate extent of the soil orders and nonsoil areas in this MLRA is as follows: Spodosols, 15 percent; Inceptisols, 5 percent; Gelisols, 5 percent; Entisols, 1 percent; other soil orders, 4 percent; and miscellaneous (nonsoil) areas, 70 percent. Area soils have a pergelic or cryic soil temperature regime, a udic or aquic soil moisture regime, and mixed mineralogy. Eutrocryepts and Dystrocryepts on strongly sloping to steep slopes are formed in gravelly colluvium over fractured bedrock of varied lithology. They range from shallow to very deep and most are well drained. Histoturbels and Aquiturbels are on similar landforms but have finer textures and are poorly drained. Haplocryods, Humicryods, and Cryaquods on mid-mountain slopes are formed in a surface layer of silty loess and volcanic ash over gravelly glacial drift or colluvium. These soils are generally deep and range from well drained to poorly drained. Cryofluvents, Cryorthents, and Cryaquents on flood plains are formed in loamy and gravelly alluvium. Flood plain soils are mostly deep and range from very poorly drained to excessively drained. Common miscellaneous areas include rock outcrop, rubble fields, talus, and permanent ice and snow.

Biological Resources

For the most part, this MLRA includes only the true alpine zone. Vegetation consists of a variety of dwarf scrub and herbaceous communities. Low willow scrub is common in drainages. Lichens and scattered herbs and dwarf shrubs dominate bedrock exposures and very shallow soils. In general, there is little or no plant growth above about 7,500 feet (2,287 meters) elevation. Along the boundary with the Cook Inlet Lowlands (MLRA 224), there are stringers and inclusions of tall alder scrub and bluejoint reedgrass grassland, characteristic of the subalpine zone.

Some of the major mammal species of the area include brown bear, Dall sheep, mountain goat, caribou, moose, wolf, coyote, fox, snowshoe hare, arctic ground squirrel, and hoary marmot. Ptarmigan, American golden plovers, golden eagles, and a wide variety of other birds are common in many places.

Land Use

Remote wildland recreation is the principal land use. The rugged mountains, extensive glaciers, ice fields, and wilderness qualities of the area attract hikers and wilderness enthusiasts from around the world. Every summer, hundreds of climbers attempt to climb Mt. McKinley and other high peaks in the area. More people visit Denali National Park than any other park in Alaska. Hunters pursue moose, caribou, Dall sheep, brown bear, and black bear. Back country recreationists and hunters are served by air taxi, guiding, and outfitting companies operating out of major Alaska communities. Many extractable minerals and other commodities occur in this MLRA. Mining was historically a major land use that helped support development in nearby lowlands.

224—Cook Inlet Lowlands

Introduction

MLRA 224 is in the Southern Region of Alaska. It includes the lowlands and lower mountain slopes of the Susitna and Matanuska Valleys, the western Kenai Peninsula, and the west side of Cook Inlet (*Figure* 1). This MLRA makes up about 2,757,439 square kilometers. This MLRA includes the most densely populated areas of Alaska and the most extensive network of highways and secondary roads in the state. Within this area are the Municipality of Anchorage; the cities of Palmer and Wasilla in the lower Matanuska Valley; and the cities of Kenai and Soldotna on the western Kenai Peninsula. Federally administered land within this MLRA includes most of Kenai National Wildlife Refuge and parts of Chugach National Forest and Denali National Park and Preserve.

Physiography

This area lies within the Coastal Trough physiographic province of the Pacific Mountain system (Wahrhaftig 1965). The terrain is predominantly a broad expanse of gently sloping to rolling plains and low to moderate relief hills bordered by the lower slopes of surrounding mountains. Depressions and shallow basins on plains are dotted with thousands of small to medium-sized lakes and interconnecting wetlands. Lakes are also common in low areas between hills. Numerous rivers, which originate in the surrounding Cook Inlet Mountains (MLRA 223), pass through the area. Most are relatively high gradient with a braided flood plain. Low to high stream terraces are common along rivers. Also within the area are the Caribou Hills, Mt. Susitna, Beluga Mountain, and the Yenlo Hills. These are isolated, low to moderately high rounded mountains that protrude above the surrounding terrain. Coalescing alluvial fans are common features on lower mountain slopes. Elevation ranges from sea level to 4,396 feet (1,340 meters) elevation.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: South Central Alaska (1905), 100 percent. All rivers and streams in this MLRA drain into Cook Inlet. Major rivers include the Susitna and Yentna Rivers in the Susitna Valley, the Little Susitna River and Matanuska River in the Matanuska Valley, and the Kenai River and Deep Creek on the Kenai Peninsula. Other important rivers or tributaries include the Kustatan on the west side of Cook Inlet; Ship Creek and Eagle River in the Municipality of Anchorage; and Willow Creek, Montana Creek, Lake Creek, and the Deshka River in the Susitna Valley. The largest lakes are Tustumena Lake and Skilak Lake on the Kenai Peninsula, and Beluga Lake on the west side of Cook Inlet. Small to medium-sized lakes are scattered throughout the rolling plains and hills in the Susitna Valley, the western Matanuska Valley, and the northern Kenai Peninsula. Lakes and other surface water make up about 15 percent of the area.

Geology

The area has experienced a complex history of repeated glaciation. During the late Pleistocene epoch, the entire area was covered by glacial ice originating from the surrounding mountains. At times during the early and middle Pleistocene, ice-dams at the lower end of Cook Inlet covered much of the area with a large pro-glacial lake. Surficial deposits on plains and hills consist of a complex mixture of glacial till and outwash. Fine textured glacio-lacustrine deposits and sand dunes are in a few locations, primarily near the coast in the southern Susitna Valley, Municipality of Anchorage, and western Kenai Peninsula. Recent fluvial deposits cover modern flood plains and stream terraces. During the Holocene epoch, wind blown sediments from non-vegetated flood

plains and volcanic activity in the Alaska and Aleutian Ranges deposited a layer of mixed loess and volcanic ash across much of the area. In the vicinity of the city of Palmer, along the lower Matanuska and Knik Rivers, the loess layer is many meters thick.

Climate

The climate of this area is considered to be transitional from temperate maritime to subarctic continental. Most weather systems originate in the North Pacific and the Gulf of Alaska. In winter, particularly in the north, arctic weather systems are more common. In the Matanuska Valley, seasonal winds pick up fine earth material from non-vegetated flood plains and create extensive dust clouds that can reach an altitude of 5,000 feet (1,524 meters) or more. The average annual precipitation is 15 to 60 inches (381 to 1,524 millimeters). Precipitation is generally greater on the southern Kenai Peninsula, in the northern Susitna Valley, and at higher elevations along the mountains. The average annual snowfall is about 60 to 120 inches (152 to 305 centimeters). The average annual temperature is about 27 to 36 degrees F (-2.8 to 2.2 degrees C). The average frost-free period ranges from about 65 to 160 days.

Soils

The approximate extent of the soil orders and nonsoil areas in this MLRA is as follows: Spodosols, 38 percent; Histosols, 23 percent; Entisols, 11 percent; Inceptisols, 11 percent; other soil orders, 2 percent; and miscellaneous (nonsoil) areas, 15 percent. Area soils have a cryic soil temperature regime, a udic or aquic soil moisture regime, and dominantly mixed mineralogy. Haplocryods (Estelle and Kenai series), Humicryods (Talkeetna series), and Eutrocryepts (Bodenburg series) and Dystrocryepts (Smithfha series) on plains and hills are formed in silty loess and volcanic ash over loamy, sandy and gravelly glacial till and outwash. These soils are generally deep and well drained. Cryaquepts (Slikok and Disappear series), on these same landforms and materials, are poorly drained or very poorly drained. Cryofibrists (Salamatof series) and Cryohemists (Starichkof series) in broad shallow basins and drainageways are formed in thick organic deposits. These Histosols are poorly drained or very poorly drained. Cryofluvents (Niklason series) and Cryaquents (Killey series) on flood plains and stream terraces are formed in stratified silty and sandy alluvium over gravelly alluvium. These soils are generally deep and range from well drained to very poorly drained. Common miscellaneous areas include tidal flats, beaches, riverwash, and water.

Biological Resources

This MLRA primarily includes the lower elevation forested and subalpine zones. Vegetation on upland sites is dominated by white spruce, paper birch, and quaking aspen. Lutz spruce become dominant on the southern Kenai Peninsula. On flood plains and seepage areas on mountain slopes, cottonwood and mixed cottonwood forests are common. Extensive lowlands and peatlands support stunted white and black spruce woodland, low scrub of ericaceous shrubs and willow, and a variety of sedge and grass meadows. Along the coast of Cook Inlet are halophytic sedge and sedge-grass meadows. At higher elevations in the subalpine zone, forest gradually gives way to bluejoint reedgrass grasslands, tall alder scrub, and low willow scrub. Dwarf scrub and herbaceous communities characteristic of the alpine zone are above about 1,800 to 2,500 feet (549 to 762 meters) elevation in the Caribou Hills on the southern Kenai Peninsula, on Mt. Susitna and the Yenlo Hills in the Susitna Valley, and along the boundary with the Cook Inlet Mountains (MLRA 223).

Since the mid 1980s, spruce bark beetles have infested tens of thousands of acres of white spruce, Lutz spruce, and mixed spruce forests on the Kenai peninsula, the southern Matanuska and

Susitna Valleys, and along the west side of Cook Inlet. Across this area, and in particular on the Kenai Peninsula, the vast majority of large diameter spruce trees have been killed by bark beetles. On the southern Kenai Peninsula, the dominant forest canopy has been entirely killed off by bark beetles.

Some of the major mammal species of the area are moose, brown bear, black bear, wolf, coyote, fox, beaver, and lynx. Caribou are common in a few places. Tundra swans, Canada geese, a wide variety of ducks, and sandhill cranes use area wetlands and lakes for nesting and as stop over sites during migration. Spruce grouse are common throughout the forests. Throughout much of the year bald eagles can be found along rivers and streams.

Most rivers and streams in the area are important spawning grounds for salmon. Thousands of visitors are attracted to the area each year for sport fishing for chinook, coho, and red salmon. Rivers on the Kenai Peninsula support anadromous steelhead fisheries. Rainbow trout are in many streams and lakes. The Alaska Department of Fish and Game also stocks many lakes throughout the area with rainbow trout. Most lakes in the Susitna valley have introduced northern pike. Pike are a major predator of small fish and waterfowl.

Land Use

Agricultural has been an important industry since the beginning of European settlement and particularly since 1935, with the establishment of the Matanuska Colony near the city of Palmer. There are other agricultural areas are in the Susitna Valley, at Point Mackenzie, and on the Kenai Peninsula around the cities of Sterling, Soldotna, and Homer. Principal crops include hay, potatoes, and other hardy vegetables. A few dairy farms are still operating in the Palmer area, at Point Mackenzie, and on the Kenai Peninsula. Cattle are grazed on native rangelands and pasture on the southern Kenai Peninsula. Logging and personal use firewood cutting are locally significant land uses. In response to the bark beetle infestation, salvage logging and other management activities on the Kenai Peninsula have resulted in construction of hundreds of miles of roads and thousands of acres of clear-cut logging. Other major industries include commercial fishing, fish processing, and oil and gas extraction.

Tourism and wildland recreation are becoming increasingly important within the area. Recreation and tourism industries include hunting, fishing, backcountry guiding, bus tours, and flight seeing. Many local residents participate in hunting for moose and other game and fishing for salmon, halibut, trout, and northern pike. In wintertime, snow machine trails crisscross the Susitna Valley. ATV trails are also extensive and provide summer and fall access to much of the area. Recreational cabins have been constructed on many lakes and other locations throughout the area. Subsistence hunting, fishing, and gathering provide food and a variety of other resources for many residents.

Urban development, particularly along the road system, is a significant land use. Most land available for development within the Municipality of Anchorage has already been developed. Rapid urbanization is occurring in the vicinity of the cities of Palmer and Wasilla in the lower Matanuska Valley and in the cities of Kenai and Soldotna on the Kenai Peninsula. Everywhere, agricultural lands are being converted to residential and small industrial land uses. Extraction of sand and gravel resources in support of construction, road building, and road maintenance impacts thousands of acres in the lower Matanuska Valley and other locations along the road system.

The major soil resource management concerns are erosion and water quality. Conservation practices that minimize ground disturbance and maintain adequate vegetation cover can lessen negative impacts. Off road vehicle use is an increasing problem throughout much of the MLRA, contributing locally to destruction of existing vegetation, soil compaction, erosion, runoff channelization, damage to stream channels and fisheries, and changes in access and land use.

225—Southern Alaska Peninsula Mountains

Introduction

MLRA 225 is in the Southern Region of Alaska. It includes the southeast-facing slopes of the southern Aleutian Mountains that drain into the lower Cook Inlet, Shelikof Strait, and the North Pacific (*Figure* 1). It makes up about 1,591,488 square kilometers. MLRA 225 is mostly undeveloped wildlands. A few small coastal villages comprise the only permanent settlements in the area. Federally administered lands within this MLRA include Becharof National Wildlife Refuge and parts of the Alaska Maritime Wildlife Refuge, Alaska Peninsula Wildlife Refuge, Lake Clark National Park and Preserve, and Katmai National Park and Preserve.

Physiography

This area lies within the Alaska-Aleutian physiographic province of the Pacific Mountain system (Wahrhaftig 1965). The terrain consists primarily of rugged, low to moderately high mountains deeply dissected with narrow, high gradient valleys. Glaciers and small ice fields are common at upper elevations on the highest peaks in the area. Glaciers and permanent ice and snow make up about 7 percent of the area. In steep, narrow valleys, coalescing fans and steep footslopes continue down to the stream channel. Flood plains and stream terraces are of limited extent, except in broader valleys at lower elevations. Along the coast of Cook Inlet is a narrow, discontinuous zone of gently sloping to moderately steep outwash plains, flood plains, and low relief hills. Elevation ranges from sea level, along the coast, to 7,090 feet (2,161 meters), at the summit of Snowy Peak.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: South Central Alaska (1905), 100 percent. All rivers and streams in the area originate from glaciers, ice fields, and mountainous uplands and drain directly into Cook Inlet. Lakes make up less than 2 percent of the area.

Geology

Except for the highest peaks and steep upper elevation ridges, the entire area was covered in glacial ice during the late Pleistocene epoch. During the Holocene epoch, glacial deposits across much of the area eroded away or were been buried by mountain colluvium and alluvium. Mountain colluvium and alluvium covers about 60 percent of the present landscape. Lightly to highly modified glacial moraines and outwash deposits and recent alluvium are extensive on lower mountain slopes and in valleys at lower elevations. Volcanic activity on Mt. Katmai and other volcanoes in the region has deposited a layer of volcanic ash across much of the landscape. The predominant geologic formations underlying most of the area are upper Jurassic, lower Tertiary, and some Cretaceous stratified sedimentary rocks. Undifferentiated volcanic rocks of Quaternary and Tertiary age are common near Mt. Katmai and other volcanoes.

Climate

Cloudy conditions and moderate to cold temperatures characterize the climate of this area. Precipitation is usually abundant throughout the year. Snowfall in winter is deep and greatly exceeds annual melt in many places, as evidenced by the abundance of glaciers and ice fields. The average annual precipitation is about 30 inches (762 millimeters) along the coast, to more than 100 inches (2,540 millimeters), at higher elevations. The average annual snowfall is about 50 to 200 inches (127 to 508 centimeters). The average annual temperature and length of the frost-free

season is not known. Freezing temperatures are likely to occur during any month of the year, particularly at higher elevations.

Soils

The approximate extent of the soil orders and nonsoil areas in this MLRA is as follows: Andisols, 45 percent; Histosols, 2 percent; Inceptisols, 1 percent; other soil orders, 1 percent; and miscellaneous (nonsoil) areas, 51 percent. Area soils have a cryic or pergelic soil temperature regime, a udic or aquic soil moisture regime, and mixed mineralogy. Haplocryands and Dystrocryepts on mountain slopes and hills are formed in a layer of silty volcanic ash of varying thickness over gravelly and loamy colluvium, slope alluvium, and glacial till. These soils range from shallow to deep and are mostly well drained. Cryaquepts in valley bottoms, depressions, and benches on mountains are formed in silty volcanic ash over loamy glacial till and colluvium. Cryaquepts are mostly deep and somewhat poorly drained. Cryofibrists, also in valley bottoms and depressions, are formed in thick organic deposits. These soils are poorly drained or very poorly drained. Common miscellaneous areas include rock outcrop, rubble fields, talus, permanent ice and snow, riverwash, tidal flats, and beaches.

Biological Resources

At lower elevations, the vegetation is mostly tall scrub dominated by alder and willow. Balsam poplar forests, with tall shrub and herbaceous understory, are on flood plains and some south-facing mountain slopes. With increasing elevation, tall scrub rapidly give way to low scrub dominated by willow, ericaceous shrubs, and various graminoids and forbs. Bluejoint reedgrass grasslands are scattered throughout the scrub. At the highest elevations and on exposed ridges and steep slopes with shallow bedrock, dwarf scrub is the dominant vegetation. Crowberry, ericaceous shrubs, willow, bryophytes, and lichens usually dominate dwarf shrub communities. Poorly drained areas and peatlands support low scrub and sedge-grass meadows.

Some of the major mammal species of the area include brown bear, Dall sheep, moose, wolf, and coyote. Ptarmigan, American golden plovers, golden eagles, and a wide variety of other birds are common in many places.

Land Use

Remote wildland recreation is the principal land use. The rugged mountains, extensive glaciers and ice fields, and wilderness qualities of the area attract visitors from around the world. Most visitors are served by air taxi, guiding, and outfitting companies operating out of major Alaska communities.

W2—Aleutian Alaska Region

This region is in Alaska. It includes the southwest portion of the Alaska Peninsula, the Aleutian Islands, and the Pribilof Islands (*Figure* 1). Elevation ranges from sea level to more than 4,000 feet (1,220 meters). The region makes up 2,759,112 square kilometers.

Land use in the region is primarily wildlife habitat and subsistence hunting, fishing, and gathering. Small communities with fishing operations are located on the few good harbors. There is also limited recreation and some livestock grazing. Cool temperatures, strong winds, fog, overcast skies, and precipitation characterize the maritime climate of the region. The annual precipitation ranges from about 21 inches to more than 78 inches (530 to 1,980 millimeters). The annual air temperature ranges from 36 to 39 degrees F (2 to 4 degrees C). The frost-free period ranges from May to mid-September.

The southwest Alaska Peninsula, Aleutian Islands, and Pribilof Islands are made up of volcanoes (many of which are active), lava flows, and tilted fault blocks of volcanic derived sediments. Landforms include steep mountain slopes, rolling hills, and steep-walled fjords and sea cliffs. The eastern portion of the region has been glaciated. The region is free of permafrost.

The dominant soils are Andisols, primarily Cryands formed in volcanic ash or scoria. Soil texture grades from coarse scoria and cinders to fine sand with increasing distance from the volcanoes. Bare rock and rubble occur on the steep slopes of volcanic cones, peaks, and high ridges. Histosols, especially Fibrists, occur in depressions and broad valley bottoms.

There are no trees in this region. Dwarf scrub vegetation occurs at the higher elevations and in areas exposed to the wind. The more protected areas have mesic graminoid herbaceous vegetation.

226—Aleutian Islands-Western Alaska Peninsula

Introduction

MLRA 226 is the only MLRA in the Aleutian Alaska Region. It includes the Aleutian Islands, the Pribilof Islands, and the southwest end of the Alaska Peninsula west of Port Moeller, Stepovak Bay and Shumagin Island (*Figure* 1). This MLRA makes up about 2,759,112 square kilometers. The area is remote and consists primarily of undeveloped wildlands. There are, however, a number of major towns, small villages, and military installations across the area. The largest communities are Cold Bay, Unalaska, Dutch Harbor, and St. Paul. Federally administered lands within this MLRA include Aniakchak National Monument and Preserve, Izembek National Wildlife Refuge, and parts of the Alaska Maritime and Alaska Peninsula National Wildlife Refuges.

Physiography

This area lies within the Alaska-Aleutian physiographic province of the Pacific Mountain system (Wahrhaftig 1965). The terrain is predominantly steep, low to moderately high, rounded mountains and isolated, moderately high volcanic cones. At lower elevations on the larger islands and on the Alaska Peninsula, broad, moderately sloping valleys and rolling uplands bordered by low relief hills are common. Valley features include gently sloping fans, narrow meandering flood plains, and shallow basins dotted with small lakes and interconnecting wetlands. The complex, irregular coastline has many prominent headlands, sea cliffs, and narrow, steep-walled bays. Elevation ranges from sea level to over 4,000 feet (1,220 meters) on many of the islands. The highest point in the Aleutian Islands is 9,372 feet (2,857 meters) at the summit of Shishaldin Volcano on Unimak Island.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Southwest Alaska (1904), 100 percent. This MLRA is drained to the North Pacific and the Bering Sea by numerous, short, steep gradient rivers and streams. Lakes make up less than 2 percent of the area.

Geology

This MLRA includes more than 50 volcanoes, most of which have been active at some time during the Quaternary and Tertiary periods. The area is formed primarily of Quaternary and Tertiary volcanic rocks and unconsolidated deposits overlying a mostly submarine ridge of Tertiary sedimentary rocks. During the Pleistocene epoch, glacial ice covered the eastern portion of the area to approximately Umnak Island. To the west, probably only upper elevations were glaciated. Volcanic activity has mantled most of the area in thick deposits of silty volcanic ash, sandy and gravelly cinders, and volcanic rubble. Some lightly to moderately modified glacial landforms and deposits are at lower elevations. Small glaciers and permanent ice and snow make up only about 1.5 percent of the present landscape and are restricted to upper elevations on the highest volcanoes. Recent coastal and fluvial deposits occur in scattered locations along the coast and on flood plains at lower elevations.

Climate

The area has a cool maritime climate characterized by cloudy and foggy conditions, moderate temperatures, and abundant rainfall. Gale force winds, occasionally approaching 100 mph (161 kph), are common during storms. The average annual precipitation ranges from 21 to about 78

inches (530 to 1,980 millimeters). Annual snowfall is 30 to 85 inches (75 to 215 centimeters) and is generally limited to higher elevations. The average annual temperature is 36 to 39 degrees F. (2 to 4 degrees C). The average frost-free period is about 115 to 140 days.

Soils

The approximate extent of the soil orders and nonsoil areas in this MLRA is as follows: Andisols, 47 percent: Histosols, 6 percent; other soil orders, 1 percent; and miscellaneous (nonsoil) areas, 46 percent. Soils in the area have a cryic soil temperature regime, a udic or aquic soil moisture regime, and mixed mineralogy. Haplocryands (Zolotai series) and Vitricryands (Polovina series), the predominant soils on most landforms, are formed in moderately thick to thick deposits of silty to sandy volcanic ash and coarse sandy to gravelly cinders over basalt bedrock. Soils range from shallow to deep and most are well drained to excessively drained. Andic, Vitrandic (Tsammana series), and Aquandic subgroups of Dystrocryepts occur where coarse marine sediments underlie volcanic deposits. Along the margins of streams and lakeshores, poorly drained or very poorly drained Cryofibrists formed in thick organic materials occur. Common miscellaneous areas include cinder land, surface basalt rock outcrops, water, riverwash, beaches, and tidal flats. Small valley glaciers and permanent ice and snow are at upper elevations on a few of the larger islands and on the Alaska Peninsula.

Biological Resources

At higher elevations, vegetation consists of a mosaic of dwarf shrub scrub characteristic of the true alpine zone. At lower elevations there are wet and dry grasslands dominated by mid-sized and tall grasses, sedges, and forbs. On peatlands, vegetation consists of low ericaceous shrub scrub. Aleutian shield-fern (*Polystichum aleuticum*), the only endangered plant species currently listed for Alaska, is found on Adak and Attu Islands. There are no naturally occurring forests in the area.

This MLRA is rich is marine and bird wildlife. Two species native to the Aleutian Islands, the Steller sea lion and the Aleutian Canada goose, are currently listed as threatened. The area is an important winter habitat for emperor geese and other waterfowl. This area also provides nesting habitat for a variety of birds, including green-winged teal, rock sandpiper, whiskered auklet, rock ptarmigan, song sparrow, rosy finch, and winter wren. The introduction of dogs, cats, and foxes has severely reduced ground-nesting birds. Rats escaping from ships also are a hazard to ground nesting birds. Northern fur seals, Steller sea lions, and sea otters are common along the coast. Pink and sockeye salmon are the most numerous fish species in the Aleutian Islands. Some of the eastern islands support small herds of caribou.

Land Use

Commercial fishing in the North Pacific and Bering Sea is the primary industrial use of the area. Most communities support a fleet of boats and related fishing facilities. Reindeer herding and harvesting of fur seals for pelts and meat are practiced on St. Paul Island. Small herds of reindeer and cattle are also on Umnak Island. Tourism and wildland recreation are becoming increasingly important. Subsistence hunting, fishing, and gathering provide food and a variety of other resources to local residents and are a major component of the local economy.

The major soil resource management concerns are erosion by water and mass wasting of soils formed in volcanic ash and cinders, particularly on steep slopes. Minimizing the degree and extent of vegetation disturbance during construction activities can minimize erosion problems. Population growth and over grazing by reindeer is a local concern. Controlling animal numbers and proper herd management can help to minimize severe grazing and allow natural restoration of depleted ranges.

X1—Interior Alaska Region

This region is in Alaska. It includes the vast interior of Alaska, from the south slope of the Brooks Range to the north slope of the Alaska Range. It also includes the Copper River Basin and its surrounding mountains (*Figure* 1). The Yukon, Tanana, and Kuskokwim Rivers drain the majority of this region to the west into the Bering Sea. Most of the Copper River Basin drains to the Gulf of Alaska via the Copper River. Elevation ranges from 100 feet (30 meters), along the Yukon River in the west, to 20,320 feet (6,195 meters), at the summit of Mt. McKinley. The region makes up 67,267,005 square kilometers.

Land use throughout the region is diverse and includes urban and rural settlement, agriculture, forestry, mining, subsistence hunting and fishing, and wildlife habitat. The subarctic continental climate is dry and cold, with short, warm summers and long, cold winters. The mean annual precipitation across the region ranges from about 6 inches, in the northwest lowlands, to 100 inches or more (152 to 2,540 millimeters), in the Alaska Range. In the summer, afternoon thunderstorms are common In valleys and at lower elevations in the mountains. Lightning caused wildfires often burn many thousands of acres. The mean annual temperature ranges from 8 to 28 degrees F (-10 to -3 degrees C), with the most variation in the mountainous areas. Frost may occur in any month.

The region consists of flood plains, broad alluvial plains and terraces, hills, mountain slopes, and ridges. The mountains surrounding the region consist of folded and faulted strata that were extensively glaciated during the Pleistocene epoch. All but the highest peaks of the Interior Alaska Highlands and the Yukon-Kuskokwim Highlands remained unglaciated. The intermountain basins of the Yukon Flats and Interior Alaska Lowlands are broad Pleistocene and Holocene floodplains and terraces. The Copper River Plateau, to the southeast, is a higher basin with broad alluvial and lacustrine terraces and glacial landforms.

This region is in the zone of discontinuous permafrost and not all soils have permafrost in their profile. The permafrost in this region is warmer than that in the Northern Alaska Region and is near 30 degrees F (-1 degrees C). Distribution of the permafrost soils is determined by landform position, particle size, and moisture content of the soil. Much of the area on the flanks of the Brooks Range and Alaska Range is covered by rock, snow, and ice. Gelisols and Inceptisols are the dominant soils. On these mountain slopes, Orthels and Turbels are intermixed with Cryepts and Cryolls. Here, the non-permafrost soils occur on steeper slopes with coarser textured parent materials and have pergelic temperature regimes. The low hills and mountains of the region have Orthels and Turbels mixed with Cryepts. An even mix of Gelisols and Inceptisols dominate the basins. The Inceptisols have a more recent history of fire than the Gelisols. Wildfires disturb the insulating organic surface, lowering the permafrost table and eliminating perched water tables from these former Gelisols. Depending on fire frequency, landform position, and particle size these Inceptisols soils may or may not revert back to Gelisols. Depressional landforms across the region contain Histosols. These organic soils include Histels with permafrost and Hemists without permafrost. To a smaller extent, Spodosols and Andisols are also present. Cryods are scattered across some of the mountainous areas. Cryands are in parts of the Yukon-Kuskokwim Highlands.

The native vegetation across the region ranges from boreal forests to alpine tundra. The southern Brooks Range and the flanks of the Alaska Range are dominated by alpine tundra with grasses, sedges, mosses, lichens, ericaceous shrubs, and willows. The low hills and mountains are a mix of alpine tundra and boreal forests. The basins are predominantly boreal forests with black spruce, white spruce, paper birch, and quaking aspen.

227—Copper River Basin

Introduction

MLRA 227 is in the Interior Region of Alaska and includes the Talkeetna, Chugach, and Wrangell Mountains. The area also includes the Copper River Plateau, a broad intermontane basin bordered by the Alaska Range (*Figure* 1). It makes up about 1,191,268 square kilometers. Although the area is traversed by the Richardson, Glenn, and Edgerton Highways, it remains mostly undeveloped wildlands and is sparsely populated. The largest community is Glennallen, at the intersection of the Richardson and Glenn Highways. Smaller communities in the area include Chitina, Copper Center, Gulkana, and Kenny Lake. Federally administered land within this MLRA includes part of the Wrangell-St. Elias National Park and Preserve. The Trans-Alaska Pipeline parallels the Richardson Highway through the area.

Physiography

This area lies within the Coastal Trough physiographic province of the Pacific Mountain system (Wahrhaftig 1965). The terrain consists primarily of nearly level to undulating plains and rolling hills. Depressions and shallow basins on plains are frequently filled with lakes and interconnecting wetlands, particularly to the west and north. Along the rivers and streams are narrow flood plains and stream terraces. In many places, the rivers are deeply incised with high escarpments and breaks between the river bottom and adjacent plains. In the north and west are isolated, low to moderate relief mountains. Long footslopes are common at the base of mountains. In general, elevation ranges from about 600 feet (183 meters), along the Copper River at Chitina, to about 2,600 feet (793 meters), along the edge of the basin. The highest point in the area is 3,806 feet (1,160 meters), at Windy Point on Slide Mountain.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: South Central Alaska (1905), 100 percent. The Copper River drains most of the area through the Chugach Mountains to the Gulf of Alaska. Major tributaries of the Copper River include the Gulkana, Gakona, Tazlina, and Chitina Rivers. The largest lakes include Lake Louise, Susitna Lake, Crosswind Lake, and Ewan Lake. Lakes make up about 10 percent of the area.

The area is in the zone of discontinuous permafrost. Permafrost close to the surface is common in finer textured sediments on plains, stream terraces, and more gently sloping footslopes and hills. Isolated masses of ground ice occur in deep loess deposits on terraces and lower sideslopes of hills. Permafrost is generally absent on flood plains and in close proximity to lakes and other water bodies.

Geology

During the latter part of the Pleistocene epoch, glacial ice dammed the Copper River drainage forming a large proglacial lake in the central area of the basin. Glaciers from the surrounding mountains extended into the basin, probably calving into the lake much of the time. At the onset of the Holocene epoch the glaciers receded and the lake emptied, exposing a broad nearly level to rolling plain. The central basin is filled with clayey lacustrine deposits that become progressively more silty toward the outer margins of the former lake. Above the level of the former lake are lightly modified glacial moraines, drift, and occasional drumlins and eskers. During the Holocene epoch, area rivers and streams cut into the lacustrine deposits, creating low to high escarpments and depositing coarse textured alluvium on flood plains and stream terraces. A layer of silty calcareous loess of varying thickness mantles much of the modern landscape. Along river escarpments in the

southeastern portion of the area, Quaternary and Tertiary volcanic rocks are exposed. Isolated mountains in the basin are formed in Permian and Pennsylvanian stratified sedimentary rocks.

Climate

Brief, warm summers and long, cold winters characterize the subarctic continental climate of the area. The average annual precipitation ranges from about 10 inches (254 millimeters), in the central basin, to more than 20 inches (508 millimeters), at higher elevations in the north and west. The average annual snowfall ranges from about 40 to 70 inches (102 to 178 centimeters). The average annual temperature ranges from about 23 to 28 degrees F (-5 to -2.2 degrees C). The average frost-free period is 35 to 90 days. Freezing temperatures in summer, particularly at higher elevations, are not unusual.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 65 percent; Inceptisols, 11 percent; Spodosols, 7 percent; Entisols, 4 percent; Mollisols, 1 percent; and miscellaneous (nonsoil) areas, 12 percent. Area soils have a pergelic or cryic soil temperature regime, an aquic or udic soil moisture regime, and mostly mixed mineralogy. Poorly drained Histoturbels (Dadina and Klawasi series) and Aquiturbels (Klanelneechena and Strelna series) are interspersed with well drained Eutrocryepts (Pippin and Gulkana series) and Cryoborolls (Kenny Lake and Tonsina series) on stream terraces, lacustrine terraces, till plains, and hills. These soils formed either in deep loess deposits or in mantles of loess overlying clayey lacustrine sediments or gravelly till and outwash. The Inceptisols and Mollisols have a more recent history of fire than the Gelisols. Wildfires can disturb the insulating organic surface, lowering the permafrost table and eliminating perched water tables from Gelisols, changing the classification. Depending on fire frequency, landform position, and particle size these soils may or may not revert back to Gelisols. Fibristels and Hemistels (Wrangell series) are in depressional areas. These organic soils are shallow to moderately deep over permafrost and poorly drained or very poorly drained. Cryofluvents (Klutina series) and Cryorthents (Gakona series) on flood plains and low terraces are formed in loamy over gravelly alluvium. Common miscellaneous areas include riverwash and water.

Biological Resources

On productive, well drained upland soils forest vegetation includes white spruce, aspen, and paper birch. White spruce and white spruce-balsam poplar forests are on high flood plains and low stream terraces. Stunted black spruce and white spruce woodland of low productivity occur on north-facing slopes, high stream terraces, and cold, wet sites with shallow permafrost. Following wildfires, willow, shrub birch, and ericaceous shrub scrub invade most sites until eventually being replaced by forest vegetation. On most forest and woodland sites, post-fire succession leads to a relatively rapid accumulation of organic matter and mosses on the surface. This leads to a decrease in soil temperature, biologic activity, nutrient availability, and a gradual decrease in site productivity. Non-forest vegetation on peatlands, in drainageways, and above treeline includes low to tall willow, shrub birch, and ericaceous shrub scrub. Wet sedge meadows, sedge-grass meadows, and sedge-moss bog meadows are along the margins of lakes and on continuously ponded sites. Willow and alder scrub are on low flood plains.

Common mammals in the area include brown bear, black bear, caribou, moose, wolf, and a variety of furbearers and rodents. Area ponds and wetlands provide high quality habitat for tundra swans and other waterfowl. Bald eagles are common along most rivers. Area rivers and lakes support lake trout, rainbow trout, grayling, burbot, northern pike, and whitefish.

Land Use

Several small farms are located in the Kenny Lake area where grasses, small grains, potatoes, and cool season vegetables are grown. Small scale timber harvesting and management occurs in a few places. Each year hunting, fishing, boating, hiking, and other wildland recreation attracts thousands of visitors to the area. Subsistence hunting, fishing, and gathering provide food and a variety of other resources to both native and non-native residents.

The major soil resource management concerns are wind erosion and water erosion in areas cleared of native vegetation. Disturbance of the insulating organic surface results in thawing of upper soil layers. This can result in ponding, soil subsidence, erosion, and disruption of surface drainage. All activities must consider the protection of the organic surface and the thermal balance of the soils.

228—Interior Alaska Mountains

Introduction

MLRA 228 is in the Interior Region of Alaska. It includes the high mountain slopes and glaciated hills and plains of the Alaska Range, Talkeetna Mountains, Chugach Mountains, Wrangell Mountains, and the northern Aleutian Range, that drain into the upper Tanana and Kuskokwim drainages (MLRA 229 for the most part) and the Copper River Plateau (MLRA 227) (*Figure* 1). It makes up about 11,512,962 square kilometers. Except for some remote lodges and a few small communities along the Parks and Richardson Highways, which bisect the mountains in three places, this MLRA is primarily undeveloped wildlands. Federally administrated lands within this MLRA include parts of Denali National Park and Preserve, Wrangell-St. Elias National Park and Preserve, and Tetlin National Wildlife Refuge. The Trans-Alaska Pipeline parallels the Richardson Highway from Paxson to Delta Junction.

Physiography

The Aleutian Range and Alaska Range portion of this area lies within the Alaska-Aleutian physiographic province. The Chugach Mountains and Wrangell Mountains portion lies within the Pacific Border Ranges province. The Talkeetna Mountains portion lies within the Coastal Trough province. All of these provinces are within the Pacific Mountains physiographic system (Wahrhaftig 1965). The terrain of the area consists of rugged, high mountains and low rounded hills and extended footslopes along the base of the mountains. Throughout, the mountains are deeply dissected by narrow to broad, high gradient valleys, typically with braided flood plains in the valley bottoms. Coalescing fans and steep footslopes are common in valleys. Large valley glaciers are occur throughout the area. Glaciers and permanent ice and snow make up about 15 percent of the area. Elevation ranges from about 1,500 feet (460 meters), near Paxson in the Copper River basin, to 20,320 feet (6,195 meters), at the summit of Mt. McKinley.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Yukon (1903), 35 percent; Southwest Alaska, 25 percent; and South Central Alaska (1905), 40 percent. The north slopes of the Aleutian Range and Alaska Range drain into the Bering Sea via the Tanana and Kuskokwim Rivers. Major tributaries of the Kuskokwim River are the Stony River and the North Fork of the Kuskokwim. Major tributaries of the Tanana River are the Kantishna, Nenana, Delta, and Nabesna Rivers. Mountains bordering the Copper River Basin drain into the Copper River and the Gulf of Alaska and North Pacific. Major tributaries of the Copper River include the Gulkana, Tazlina, and Chitna Rivers. The headwaters of the Susitna River, which drains into the Cook Inlet Lowlands (MLRA 224) and Cook Inlet, are also in this MLRA. Lakes and ponds make up less than 1 percent of the area. There are, however, a number of large lakes and lake systems in the area, including Tazlina, Klutina, and Tonsina Lakes in the Chugach Mountains and Paxson Lake and the Tangle Lakes system in the Alaska Range.

This area is in the zone of discontinuous permafrost. Permafrost close to the surface is generally restricted to finer textured sediments on stream terraces and swales on hills and footslopes. In the mountains, permafrost is generally absent except on gently sloping, rounded ridges, swales, and footslopes. Permafrost is generally absent on flood plains.

Geology

During the late Pleistocene epoch, all but the highest peaks and steep upper elevation ridges of this area was covered in glacial ice. For the most part, glacial deposits eroded away or were buried

by mountain colluvium and alluvium, which accumulated during the Holocene epoch across about 60 percent of the landscape. Lightly to highly modified glacial moraines, drift, and outwash deposits are extensive on lower mountain slopes and in valleys at lower elevations. Silty eolian deposits are limited to lower mountain slopes and valleys. Valley bottoms are buried in recent fluvial deposits. Bedrock geology consists primarily of upper Paleozoic and Mesozoic sedimentary, metamorphic, and igneous rocks and Tertiary intrusive and volcanic rocks.

Climate

Brief, cool summers and long, cold winters characterize the subarctic continental climate of the area. The extreme variation in elevation of this MLRA results in a wide range of climatic conditions. The average annual precipitation ranges from about 15 to 20 inches (381 to 508 millimeters) at lower elevations, to as much as 100 inches (2,540 millimeters) at the highest elevations in the Alaska Range and Wrangell Mountains. Rainfall is generally greatest in July, August, and early September. The average annual snowfall ranges from about 70 to 400 inches (178 to 1,016 centimeters). The average annual temperature at McKinley Park headquarters in the Alaska Range is 27 degrees F (-3.1 degrees C). The average frost-free period is about 50 to 80 days. At higher elevations, freezing temperatures can occur during every month.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 18 percent; Inceptisols, 13 percent; Spodosols, 7 percent; Entisols, 3 percent; other soil orders, 1 percent; and miscellaneous (nonsoil) areas, 58 percent. Area soils have a pergelic or cryic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. Histoturbels and Aquiturbels on mountain slopes, hills, and plains are formed in loamy and gravelly glacial till. These soils are shallow to moderately deep over permafrost and most are poorly drained. Eutrocryepts and Dystrocryepts on steep mountain slopes are formed in gravelly colluvium over fractured bedrock. These soils do not have permafrost and are shallow to very deep and well drained. Haplocryods on outwash plains, hills, and terraces are formed in a thin layer of silty eolian deposits over sandy and gravelly outwash and alluvium. These soils are somewhat excessively drained. Cryofluvents and Cryorthents on flood plains are formed in loamy alluvium over sandy and gravelly alluvium. These soils range from somewhat poorly drained to well drained. Common miscellaneous areas include rock outcrop, talus, and permanent snow and ice.

Biological Resources

This MLRA includes the true alpine and the subalpine zones. Alpine vegetation consists of a variety of dwarf scrub and herbaceous communities. Black crowberry, ericaceous shrubs, dwarf willow, or dryas typically dominates dwarf scrub. Various sedges, grasses, and low forbs dominate in herbaceous communities. Low willow scrub is common in drainages. Lichens, scattered herbs, and dwarf shrubs dominate bedrock exposures and very shallow soils. In general, there is little or no plant growth above about 7,500 feet (2,287 meters) elevation. The predominant vegetation in the subalpine zone is low and medium scrub dominated by shrub birch and ericaceous shrubs that grade into white spruce woodlands at lower elevations. Tall alder scrub is common in many places.

Some of the major mammal species of the area include brown bear, black bear, Dall sheep, caribou, moose, wolf, coyote, fox, snowshoe hare, arctic ground squirrel, and hoary marmot. Ptarmigan, American golden plovers, golden eagles and a wide variety of other birds are common in many places.

Land Use

Remote wildland recreation is the principal land use. The rugged mountains, extensive glaciers, and wilderness qualities of the area attract hikers and wilderness enthusiasts from around the world. Every summer, hundreds of climbers attempt to climb Mt. McKinley and other high peaks in the area. More people visit Denali National Park than any other park in Alaska. Hunters pursue moose, caribou, Dall sheep, brown bear, and black bear. Back country recreationists and hunters are served by air taxi, guiding, and outfitting companies operating out of major Alaska communities. Mining was historically a major land use that helped support development in nearby lowlands. Usibelli Coal Mine operates a large-scale open-pit coal mine in the mountains near Healy, which provides fuel for electrical generator plants in Fairbanks and elsewhere in Alaska. Small-scale commercial and recreational gold mines operate along a number of streams.

229—Interior Alaska Lowlands

Introduction

MLRA 229 is in the Interior Region of Alaska and includes the flood plains and terraces along the upper reaches of the Tanana and Kuskokwim Rivers and middle reaches of the Yukon River (*Figure* 1). This MLRA makes up about 9,422,143 square kilometers. The southwest portion of this MLRA and nearby portions of Interior Alaska Highlands (MLRA 231) are the second most densely populated areas in Alaska. Principal communities along the road system include the Municipality of Fairbanks, the towns of Nenana, Delta Junction, and Tok, and parts of Fort Wainwright and Fort Greely, the two largest military reservations in Alaska. Elsewhere, the area is mostly undeveloped wildlands and is sparsely populated. In the west, the communities of Tanana, Galena, and McGrath are accessible only by air or by river. Federally administered lands within this MLRA include parts of Denali National Park and Preserve and Tetlin National Wildlife Refuge. The Trans-Alaska Pipeline parallels the Alaska Highway from Delta Junction to Fairbanks.

Physiography

This area lies within the Western Alaska and Northern Uplands and Lowlands physiographic provinces of the Intermontane Uplands and Lowlands system (Wahrhaftig 1965). The terrain of the area consists of broad, nearly level, braided to meandering floodplains, stream terraces and outwash plains. In many places, shallow basins and undulating stream terraces are dotted with hundreds of small to medium-sized lakes and interconnecting wetlands. Sloughs, oxbow lakes, and low to high escarpments along river channels are other features associated with the flood plains, terraces, and basins. Scattered throughout the area are isolated, bedrock controlled hills and low to moderate relief mountains. Extended footslopes are common at the base of hills and mountains and along the boundaries with adjoining mountainous MLRAs. Elevation ranges from about 100 feet (30 meters), in the southwest along the lower Yukon River, to about 1,900 feet (600 meters), in the upper Tanana Valley.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA are as follows: Yukon (1903), 75 percent and Southwest Alaska (1904), 25 percent. All of the area drains to the Bering Sea via the Tanana, Yukon, and Kuskokwim Rivers. Major tributaries of the Tanana River include the Kantishna, Nenana, Delta, and Nabesna Rivers. Major tributaries of the Yukon River, in addition to the Tanana, include the Koyukuk and Innoko Rivers. Major tributaries of the Kuskokwim include Stony River and the North Fork of the Kuskokwim. Lakes make up about 10 percent of the area.

The area is in the zone of discontinuous permafrost. Permafrost close to the surface is common in finer textured sediments on plains, stream terraces, and more gently sloping footslopes and hills. Isolated masses of ground ice occur in deep loess deposits on terraces and lower sideslopes of hills. Permafrost is generally absent on flood plains and in areas near lakes and other water bodies.

Geology

Although never glaciated, the area is filled with a deep layer of Pleistocene glaciofluvial deposits. Along the Tanana and Kuskokwim Rivers, additional fluvial sediments from the Alaska Range and northern Aleutian Range accumulated during the Holocene epoch. The Koyukuk and lower Yukon River drainages have undergone several periods of deposition followed by erosion. In places, old terraces are 33 to 250 feet (10 to 75 meters) above the flood plain. Quaternary glaciofluvial and fluvial sediments are estimated to be as much as 330 to 660 feet (100 to 200 meters) deep

throughout the area. Much of the area, particularly along the Tanana and Kuskokwim Rivers, is mantled with a layer of silty micaceous loess originating from the non-vegetated flood plains and outwash plains along the Alaska Range. Deep eolian deposits, including loess and sand dunes, make up approximately 12 percent of the area. Near the mountains are inclusions of glacial moraines and drift. Unconsolidated sediments bury the bedrock geology except for occasional structural hills.

Climate

Short, warm summers and long, very cold winters characterize the subarctic continental climate of the area. The average annual precipitation ranges from 10 to 15 inches (254 to 380 millimeters) in the east and north to 15 to 20 inches (380 to 508 millimeters) in the south and west. Maximum precipitation occurs in late summer, mainly as a result of thunderstorms. The average annual snowfall ranges from 30 to 80 inches (76 to 203 centimeters). The average annual temperature ranges from about 22 degrees F in the east to 28 degrees F (-5.5 to -4 degrees C) in the west. The average frost-free period is about 70 to 120 days. The temperature usually remains above freezing from June through mid-September.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 37 percent; Inceptisols, 28 percent; Entisols, 8 percent; Spodosols, 6 percent; other soil orders, 2 percent; and miscellaneous (nonsoil) areas, 19 percent. Area soils have a pergelic or cryic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. Many of the soils have a significant mica content that was derived from source parent materials. Aquiturbels (Tanana series) and Histoturbels (Tanacross series) on nearly level stream terraces and outwash plains are formed in silty loess of varying thickness over loamy, sandy, and gravelly alluvial deposits. On elongated footslopes, these soils are formed in silty loess over loamy slope alluvium and colluvium. Hemistels (Bolio series) and Fibristels (Lemeta series) in depressions on stream terraces, outwash plains, and elongated footslopes are formed in deep organic materials. All of the Gelisols are shallow to moderately deep over permafrost and poorly drained or very poorly drained. Wildfires can disturb the insulating organic surface, lowering the permafrost table and eliminating perched water tables from Gelisols, changing the classification. Depending on fire frequency, landform position, and particle size these soils may or may not revert back to Gelisols. Eutrocryepts (Volkmar series), Dystrocrepts (Zitziana series), Cryaquepts (Liscum series), and Haplocryods occur on the same landforms and are formed in the same materials as the Gelisols. However, unlike the Gelisols they lack permafrost within the soil profile. The Eutrocryepts, Dystrocryepts, and Haplocryods are well drained to excessively drained. The Cryaquepts are poorly drained or very poorly drained. Cryorthents (Chena series) and Cryofluvents (Jarvis and Salchaket series) on flood plains and low stream terraces are formed in stratified silty, sandy, and gravelly alluvium. These Entisols range from moderately well drained to excessively drained. Very poorly drained Cryofibrists, formed in floating fibrous peat, are along the margins of lakes and in shallow basins. Common miscellaneous areas include riverwash and water.

Biological Resources

Forests on productive, well drained, upland soils includes white spruce and mixed white spruce, paper birch, and quaking aspen. White spruce and white spruce-balsam poplar forests are on high flood plains and low stream terraces. Stunted black spruce and white spruce woodland of low productivity occurs on north-facing slopes, high stream terraces, and cold, wet sites with shallow permafrost. On permafrost flats, tamarak and paper birch are occur in association with spruce.

Lightning caused wildfires are common, often burning many thousands of acres during a single fire. Following wildfires, willow, shrub birch, and ericaceous shrub scrub invade most sites until eventually being replaced by forest vegetation. On all forest and woodland sites, post-fire succession leads to a relatively rapid accumulation of organic matter and mosses on the surface. This results in decreased soil temperature, biologic activity, nutrient availability, and a gradual decrease in site productivity. Non-forest vegetation includes low to tall willow, shrub birch, and ericaceous shrub scrub on peatlands and in drainageways. Wet sedge meadows, sedge-moss bog meadows, and sedge-grass meadows are along the margins of lakes and on continuously ponded sites. Low to tall willow and alder scrub are on low flood plains.

Common mammals in the area include brown bear, black bear, caribou, moose, wolf, lynx, and a variety of furbearers and rodents. Area ponds and wetlands provide high quality habitat for tundra swans, sandhill cranes, and other waterfowl. Bald eagles are common along most rivers. Area rivers and lakes support salmon, lake trout, rainbow trout, arctic grayling, burbot, northern pike, blackfish, and whitefish.

Land Use

Farming is a major land use in the Tanana Valley near Fairbanks and Delta Junction. Grasses, small grains, potatoes, and other cool season vegetables are the principal crops. Some dairy cattle, beef cattle, and hogs are also raised. The flood plains and low stream terraces along the Tanana and Yukon Rivers are some of the most productive forestlands in Interior Alaska. Logging provides important wood products for local use and export. Extractable minerals, in particularly gold and silver, occur in certain areas. Placer mining along the rivers and placer and hard rock mining in the adjacent Interior Alaska Highlands (MLRA 231) helped support settlement and development in the area. Wildland recreation, primarily hunting for moose and other game, is also a significant land use. Many residents of the area rely on subsistence hunting, fishing, and gathering for a large part of their food. Urban development, particularly along the road system, has impacted thousands of acres. Urban development and road construction requires a significant quantity of construction material, and gravel pits of various sizes are along major roads and near urban developments.

The major soil resource management concerns are wind erosion and water erosion in areas cleared of native vegetation. Most urban and rural developments are located adjacent to rivers, where flooding is a severe hazard. Flooding is associated with spring snowmelt and runoff from adjacent mountains and ice jamming at river bends during break up.

230—Yukon-Kuskokwim Highlands

Introduction

MLRA 230 is in the Interior Region of Alaska and includes the mountains, hills, and valleys of the Lime Hills, Kuskokwim Mountains, and eastern side of the Nulato Hills (*Figure* 1). This MLRA makes up about 15,528,478 square kilometers. The area is mostly undeveloped wildlands and is sparsely populated. Principal communities, which are located along the banks of major rivers, include Sleetmute, Lime Village, and Takotna. A number of other communities that supported past hard rock mining operations have been abandoned. Federally administrated lands within this MLRA include parts of the Nowitna National Wildlife Refuge and Lake Clark National Park and Preserve.

Physiography

This area lies within the Western Alaska physiographic province of the Intermontane Uplands and Lowlands system (Wahrhaftig 1965). The terrain consists of moderate to high relief mountains and narrow flat-bottomed valleys. The highest local relief is in the Kuskokwim Mountains. Local relief in the Nulato, Nushagak, and Lime Hills is generally less. Mid to upper elevations in most of the mountains have gently to strongly sloping, rounded summits. In a few places, particularly at the highest elevations in the Kuskokwim Mountains, the mountains are more rugged and sharp ridged. Valley bottoms consist of nearly level flood plains and stream terraces, which give rise to moderately steep mountain footslopes and alluvial and colluvial fans at the base of the mountains. Elevation ranges from about 30 feet (9 meters), in the west along the edge of the Yukon-Kuskokwim Coastal Plain (MLRA 238), to 4,508 feet (1,374 meters), at the summit of Von Frank Mountain in the southeastern Kuskokwim Mountains.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Southwest Alaska (1904), 65 percent and Yukon (1903), 35 percent. The eastern slope of the Nulato Hills, the Kuskokwim Mountains, and the western portion of the Lime Hills drain into the Bering Sea via the Yukon, Innoko, and Kuskokwim Rivers. The eastern and southern Lime Hills drain into the Mulchatna and Nushagak Rivers and Bristol Bay. Lakes make up about 7 percent of the area.

This area is in the zone of discontinuous permafrost. Permafrost close to the surface is common in finer textured sediments throughout the area. Isolated masses of ground ice occur in deep loess deposits on terraces and lower sideslopes of hills. The prevalence of permafrost decreases to the southwest. Permafrost is generally absent on flood plains and south-facing slopes on steep mountains.

Geology

The Lime Hills in the southeast were extensively glaciated in the Pleistocene epoch from glaciers originating in the Alaska Range and northern Aleutian Range. Glacial moraines and drift are common in this part of the area. Elsewhere, the area was mostly unglaciated and upland positions are covered primarily in bedrock colluvium and slope alluvium originating from the underlying bedrock. Silty loess deposits of limited extent cover footslopes and lower backslopes of hills near major rivers. Bedrock geology consists primarily of Cretaceous and lower Paleozoic stratified sedimentary rocks and frequent, sometimes extensive inclusions of Cretaceous and Tertiary intrusive and volcanic rocks. The area is cut by numerous northeast trending faults. Quaternary fluvial and eolian deposits cover valley bottoms and lower mountain slopes.

Climate

The climate of this area is transitional from subarctic continental in the east to maritime in the southwest along the edge with the Western Region of Alaska. The average annual precipitation ranges from about 10 to 15 inches (254 to 381 millimeters), at lower elevations in the east, to 20 to 40 inches (508 to 1,016 millimeters), at higher elevations in the west and southwest. The average annual snowfall ranges from about 80 to 100 inches (203 to 254 centimeters). The average annual temperature is estimated to be about 20 to 25 degrees F (-6.7 to -3.9 degrees C). The average frost-free period at lower elevations is about 60 to 80 days.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 48 percent; Inceptisols, 20 percent; Spodosols, 15 percent; Entisols, 5 percent; other soil orders, 2 percent; and miscellaneous (nonsoil) areas, 10 percent. Area soils have a cryic or pergelic soil temperature regime, an aquic or ustic soil moisture regime, and most have mixed mineralogy. Aquiturbels on long footslopes, ridges above treeline, and on solifluction lobes are formed in gravelly colluvium or in loess over gravelly colluvium. Histoturbels on north slopes, footslopes, rolling uplands, and valley bottoms are formed in moderately thick organic material over loamy colluvium or loess. Fibristels and Hemistels are formed in deep organic material in depressions and in thermokarst depressions on terraces and swales on hillslopes. Gelisols are shallow to moderately deep over permafrost and poorly drained or very poorly drained. Wildfires can disturb the insulating organic surface, lowering the permafrost table and eliminating perched water tables from Gelisols, changing the classification. Depending on fire frequency, landform position, and particle size these soils may or may not revert back to Gelisols. Dystrocryepts and Eutrocryepts on upper slopes and ridges are formed in colluvium over fractured bedrock. Humicryods and Haplocryods on south slopes and stream terraces are formed in loess over loamy or gravelly alluvium. Inceptisols and Spodosols lack permafrost within the soil profile and are generally well drained. Cryofluvents, Cryaquents, and Cryorthents on flood plains are formed in stratified loamy, sandy, and very gravelly alluvium. These soils range from very poorly drained to excessively well drained. Common miscellaneous areas include surface bedrock and talus. In many valleys placer mine tailings are common.

Biological Resources

The predominant vegetation on well drained soils on mountain slopes at low and mid-elevations are white spruce forests and woodlands, mixed spruce-hardwood forests, tall alder shrub, tall and low willow scrub, and low ericaceous scrub. On peatlands and moderately well drained mineral soils are black spruce woodlands and low ericaceous and shrub birch scrub, often with tussock forming sedges or various sedges and grasses in the ground layer. In drainages and on lake shores are wet sedge meadows, sedge-grass meadows, and sedge-moss meadows. On well drained soils in valley bottoms at lower elevations are white spruce, balsam poplar, and mixed balsam poplar-white spruce forests. At higher elevations and on shallow soils on convex mountain slopes and ridges, dwarf alpine scrub dominated by ericaceous shrub, dryas, and shrub birch is the common vegetation. These communities often have considerable lichen cover and bare ground. Bedrock exposures with only scattered shrubs and herbs in pockets of fine earth and lichens dominate the highest elevations and ridges.

Common mammals include brown bear, black bear, moose, caribou, wolf, and a variety of furbearers and small mammals. Golden eagles and peregrine falcons nest on cliffs along major rivers and on rock outcrops on upper elevation ridges. Area rivers support runs of salmon. Arctic grayling are common in clear water streams.

Land Use

The majority of the area is still in natural vegetation and is primarily used by local residents for subsistence hunting, fishing, and gathering. Mining for gold, silver, and other extractable minerals and commodities has been a significant land use in the past. Most mines have ceased operation. People from outside the MLRA use the area for hunting and wildland recreation.

The major soil resource management concerns relate to erosion of the thin upland soils and disturbance of the fragile permafrost soils. Disturbance of the insulating organic surface results in thawing of upper soil layers. This can result in ponding, soil subsidence, erosion, and disruption of surface drainage. All activities must consider the protection of the organic surface and the thermal balance of the soils.

231—Interior Alaska Highlands

Introduction

MLRA 231 is in the Interior Region of Alaska and includes the extensive hills, low to moderately high mountains, and valleys between the Tanana River on the south and the Brooks Range on the north (*Figure* 1). This MLRA makes up about 17,953,221 square kilometers. The area is traversed by a number of major roads, including the Taylor Highway in the east and the Steese, Elliot, and Dalton Highways north of Fairbanks. The area is still mostly undeveloped wildlands and is sparsely populated. Principal communities along the road system include part of the Municipality of Fairbanks and the nearby communities of Eagle, Circle, Central, and Livengood. In the northwest, there are a number of remote villages, located primarily along the major rivers. Federally administered lands within this MLRA include the Yukon-Charley National Park and Preserve, White Mountains National Recreation Area, and part of the Yukon Flats National Wildlife Refuge and Arctic National Wildlife Refuge. The Trans-Alaska Pipeline parallels the Elliot Highway and Dalton Highway from Fairbanks north to the Brooks Range.

Physiography

This area lies within the Northern Uplands and Lowlands physiographic province of the Intermontane Uplands and Lowlands system (Wahrhaftig 1965). The terrain consists mostly of moderately steep to steep, moderate to high relief hills and mountains, and narrow to broad, flat-bottomed valleys. Mountains are generally rounded at lower elevations and sharp ridged at upper elevations. In the Davidson Mountains in the northwest, the mountains are rounded to flat-topped at upper elevations. Elevation ranges from about 400 feet (125 meters), in the west along the boundary with the Interior Alaska Lowlands (MLRA 229), to 6,583 feet (2,007 meters), at the summit of Mt. Harper in the southeast.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Yukon (1903) 100 percent. This MLRA drains into the Bering Sea via the Yukon, Tanana, and Koyukuk Rivers. Major tributaries of the Yukon River include the Porcupine, Chandalar, Fortymile, and Charley Rivers. Major tributaries of the Tanana River include the Goodpaster, Salcha, Chatanika, and Melozitna Rivers. The upper Kanuti River is the major tributary of the Koyukuk River in the area. Lakes make up less than 2 percent of the area.

This area is in the zone of discontinuous permafrost. Permafrost close to the surface is common in finer textured sediments throughout the area. Isolated masses of ground ice occur in deep loess deposits on terraces and lower sideslopes of hills. Permafrost is generally absent on flood plains and south-facing slopes on steep mountains. Periglacial features, such as pingos, thermokarst pits and mounds, ice wedge polygons, and earth hummocks are on lower slopes and upland valleys, particularly in the Davidson Mountains in the northwest.

Geology

Except on the highest mountains and in the north where glaciers extended into the area from the Brooks Range, this MLRA remained unglaciated during the Pleistocene epoch. For the most part, glacial moraines and drift are limited to the upper elevations of the highest mountains. The majority of the landscape is mantled in bedrock colluvium and slope alluvium originating from the underlying bedrock. Valley bottoms are filled with Holocene fluvial deposits and slope alluvium from adjacent mountain slopes. A mantle of silty loess, which originated from non-vegetated flood plains in and adjacent to the area covers many surfaces. On the low hills near major river valleys the loess is

many feet thick. On high ridges the loess is less than a foot thick. The highest ridges have exposed bedrock. Predominate bedrock types in the northeast include Paleozoic sedimentary and Permian through Jurassic igneous rocks; in the east, Permian and lower Cretaceous sedimentary and metamorphic rocks; and, in the southwest and west, Precambrian and Paleozoic metamorphic and sedimentary rocks with common Cretaceous intrusives.

Climate

Short, warm summers and long, cold winters characterize the subarctic continental climate of the area. The average annual precipitation ranges from less than 10 inches (254 millimeters), in valley bottoms and lowlands in the northeast, to 20 to 40 inches (508 to 1,016 millimeters), at higher elevations. Maximum rainfall occurs in late summer, mainly as a result of thunderstorms. The average annual snowfall ranges from about 45 to 100 inches (114 to 254 centimeters). The average annual temperature is about 10 to 16 degrees F (-12.2 to -8.8 degrees C) in the north and 20 to 25 degrees F (-6.7 to -3.9°C) in the south. The average frost-free period at lower elevations is about 60 to 100 days and the temperature usually remains above freezing from June through mid-September.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 52 percent; Inceptisols, 32 percent; Entisols, 10 percent; Spodosols, 3 percent; other soil orders, 1 percent and miscellaneous (nonsoil) areas, 2 percent. Area soils have a pergelic or cryic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. Many of the soils have a significant mica content derived from micaceous parent materials. Histoturbels (Ester and Goldstream series), Aquiturbels (Bradway and Chatanika series), and Haploturbels on north-facing slopes, footslopes on southerly aspects, and in valleys are formed in deep silty loess or loess overlying loamy and gravelly colluvium. On steeper slopes, fractured bedrock is often in the soil profile. On stream terraces, these Gelisols are formed in loamy alluvial deposits. Fibristels (Lemeta series) and Hemistels (Bolio series) are in depressions on stream terraces and footslopes and in swales on hills and mountains. All of the Gelisols are shallow to moderately deep over permafrost and poorly drained or very poorly drained. Wildfires can disturb the insulating organic surface, lowering the permafrost table and eliminating perched water tables from Gelisols, changing the classification. Depending on fire frequency, landform position, and particle size these soils may or may not revert back to Gelisols. Dystrocryepts (Brigadier and Gilmore series), Eutrocryepts (Fairbanks and Steese series), and Haplocryods formed in silty loess over loamy and gravelly colluvium and loamy and gravelly colluvium over fractured bedrock are on mountain and hill slopes, especially south-facing slopes. On lower slopes near major rivers, these soils formed in a loess cap many feet thick. The loess consists of both wind blown materials and colluvial silt that has eroded and washed down from adjacent slopes. Inceptisols and Spodosols lack permafrost within the soil profile and are generally moderately deep to deep and well drained. Cryofluvents (Jarvis series) and Cryorthents (Chena series) on flood plains are formed in stratified loamy, sandy, and very gravelly alluvium. These soils range from very poorly drained to excessively well drained. Common miscellaneous areas include surface bedrock and talus. In many valleys, placer mine tailings are common.

Biological Resources

Most of the area is forested below an elevation of about 1,800 to 2,000 feet (548 to 610 meters). White spruce, paper birch, quaking aspen, and mixed forests cover most slopes. White spruce forests and mixed white spruce-balsam poplar forests are common on high flood plains and low

terraces. Black spruce woodlands grow on steep north-facing slopes, high stream terraces, and other sites with poor drainage and shallow permafrost. Tussock forming sedges are often dominant in the ground layer. Low to tall willow and alder scrub are extensive on low flood plains. Lightning-caused wildfires are common, often burning many thousands of acres during a single fire. Following wildfires, willow, shrub birch, and ericaceous shrub scrub invade most sites until eventually being replaced by forest vegetation. With increasing elevation, the forests and woodlands give way to low scrub dominated by shrub birch and ericaceous shrubs. At even higher elevations and on shallow soils on convex mountain slopes and ridges, dwarf alpine scrub dominated by ericaceous shrub, dryas, and shrub birch are the common vegetation. These communities often have considerable lichen cover and bare ground. Bedrock exposures with only scattered shrubs and herbs in pockets of fine earth and lichens dominate the highest elevations and ridges.

Common mammals in the area include moose, caribou, black bear, brown bear, wolf, wolverine, and a variety of furbearers and small mammals. Dall sheep are in some of the higher mountains. Golden eagles are common at higher elevations and peregrine falcons nest in rocky canyons along many rivers. Area wetlands provide high quality habitat for waterfowl, sandhill cranes, and other birds. Clearwater streams support runs of salmon and are important habitat for arctic grayling.

Land Use

A number of farms in the area produce hay, small grains, potatoes, and other cool season vegetables. Logging provides important wood products for local use and export. Extractable minerals, particularly gold and silver, occur in certain areas. Mining in the area and the adjacent Interior Alaska Lowlands (MLRA 229) helped support settlement and development in the area. Urban development near Fairbanks, wildland recreation, and hunting for moose and other game are other significant land uses. The Alaska road system penetrates much of the area and provides good access for recreational activities. Subsistence hunting, fishing, and gathering provide food and a variety of other resources for local residents.

The major soil resource management concerns relate to erosion of the thin upland soils and disturbance of the fragile permafrost soils. Disturbance of the insulating organic surface results in thawing of upper soil layers. This can result in ponding, soil subsidence, erosion, and disruption of surface drainage. All activities must consider the protection of the organic surface and the thermal balance of the soils.

232—Yukon Flats Lowlands

Introduction

MLRA 232 is in the Interior Region of Alaska and includes the broad expanse of lowlands and low hills adjacent to the middle reaches of the Yukon River, known locally as the Yukon Flats (*Figure* 1). This MLRA makes up about 3,316,791 square kilometers. The area, which is not accessible from the road system, is mostly undeveloped wildlands and is sparsely populated. A number of villages are scattered along the Yukon and other major rivers. The largest of these villages are Ft. Yukon, Venetie, and Stevens Village. Many fishing and hunting camps, which are occupied seasonally by local residents, are located along the rivers. Federally administered land within this MLRA includes part of the Yukon Flats National Wildlife Refuge.

Physiography

This area lies within the Northern Uplands and Lowlands physiographic province of the Intermontane Uplands and Lowlands system (Wahrhaftig 1965). The terrain of this MLRA consists primarily of a marshy complex of nearly level to undulating stream terraces and flood plains adjacent to the Yukon River. Thousands of lakes, ponds, and interconnecting wetlands fill depressions, shallow basins, and abandoned river channels across the stream terraces. Flood plain features include multiple channels and islands, meander scars, oxbow lakes, sloughs, and low escarpments. Water in the lakes and wetlands is maintained by the yearly flooding associated with spring breakup of ice on the Yukon River and its tributaries. Surrounding the basin floor are strongly sloping to rolling uplands formed by the elongated footslopes and coalescing alluvial fans from the surrounding hills and mountains of the Interior Alaska Highlands (MLRA 231). Elevation ranges from about 300 feet (91 meters) to about 1,000 feet (305 meters).

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Yukon (1903), 100 percent. All of the area drains into the Yukon River and the Bering Sea. Within the Yukon Flats the major tributaries flowing into the Yukon River are the Porcupine, Sheenjek, Black, and Chandalar Rivers. Lakes make up about 20 percent of the area.

The area is in the zone of discontinuous permafrost. Permafrost close to the surface is common in finer textured sediments on plains, stream terraces, and more gently sloping footslopes and hills. Isolated masses of ground ice occur in deep loess deposits on terraces and lower sideslopes of hills. Permafrost is generally absent on flood plains and near lakes and other water bodies.

Geology

The Yukon Flats Lowlands is a broad intermontane tectonic basin filled with Quaternary and earlier glaciofluvial and fluvial sediments. In the central part of the basin, the glaciofluvial and fluvial deposits overlie lacustrine sediments. Unconsolidated sediments are estimated to be from 300 to 400 feet (90 to 120 meters) deep or greater near the center of the basin. Along the edge of the basin, much of the landscape is mantled with a thick layer of silty loess of Pleistocene and Holocene age. Sand dunes cover some areas. Fluvial and eolian sediments continue to be deposited today. The underlying bedrock geology is completely buried by unconsolidated sediments.

Climate

Short, warm summers and long, very cold winters characterize the subarctic continental climate of the area. The surrounding hills and mountains of this MLRA partially isolate it from weather

systems affecting other Interior lowlands. This results in temperatures that are generally warmer in summer and colder in winter than other places of comparable latitude. The average annual precipitation ranges from about 6 inches (152 millimeters), in the central basin, to 15 inches (381 millimeters), along the boundary with surrounding highlands. Maximum precipitation occurs in late summer, mainly as a result of thunderstorms. The average annual snowfall is about 45 to 55 inches (114 to 140 centimeters). The average annual temperature ranges from about 20 to 25 degrees F (-6.6 to -3.8 degrees C). The average frost-free period is 70 to 120 days. The temperature usually remains above freezing from early June through late August.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 34 percent; Inceptisols, 26 percent; Entisols, 18 percent; other soil orders, 2 percent; and miscellaneous (nonsoil) areas, 20 percent. Area soils have a pergelic or cryic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. Aquiturbels and Histoturbels on nearly level stream terraces are formed in loamy, sandy, and gravelly alluvial deposits. Histoturbels have a moderately thick organic surface layer over the mineral materials. On elongated footslopes, these soils are formed in silty loess over loamy slope alluvium. Fibristels and Hemistels in abandoned channels and depressions on stream terraces and on the margins of lakes are formed in thick organic materials. The Gelisols are shallow to moderately deep over permafrost and are poorly drained or very poorly drained. Wildfires disturb the insulating organic surface, lowering the permafrost table and eliminating perched water tables from some Gelisols. Depending on fire frequency, landform position, and particle size these soils may or may not revert back to Gelisols. Eutrocryepts, Dystrocryepts, and Cryaquepts on nearly level stream terraces, rolling uplands, and bluffs along the major river channels, some of which are calcareous loess. On some rolling uplands and stream terraces these soils have a moderately thick to thick layer of silty loess over alluvial materials. Cryorthents and Cryofluvents on flood plains and low stream terraces are formed in loamy, sandy, and gravelly alluvium. These soils range from very poorly drained to excessively drained. Very poorly drained Cryofibrists and Cryohemists formed in deep organic materials are along lake margins and in abandoned channels and depressions on stream terraces. Common miscellaneous areas include riverwash and water.

Biological Resources

Forest vegetation on productive, well drained, upland soils include white spruce, paper birch, quaking aspen, and mixed white spruce-paper birch-quaking aspen forests. Balsam poplar and mixed white spruce-hardwood forests are on high flood plains and low stream terraces. Stunted black spruce and white spruce woodland of low productivity occurs on high stream terraces, and cold, wet sites with shallow permafrost. Tussock forming sedges and mosses are often dominant in the ground layer. Paper birch and, in places, tamarack are found in association with spruce on permafrost flats. Lightning caused wildfires are common, often burning many thousands of acres during a single fire. Following wildfires, willow, shrub birch, and ericaceous shrub scrub invade most sites, eventually being replaced by forest vegetation. On all forest and woodland sites, post-fire succession leads to a relatively rapid accumulation of organic matter and moss on the surface. This leads to a decrease in soil temperature, biologic activity, nutrient availability, and a gradual decrease in site productivity. Tall and low scrub dominated by willow and alder are common on low flood plains. Vegetation on the wettest sites is predominantly tall to low alder and willow scrub, sedge-shrub meadows, sedge meadows, and sedge-moss bog meadows.

Common mammals include moose, black bear, brown bear, wolf, caribou, wolverine, lynx, and a variety of furbearers and small mammals. Area wetlands provide high quality nesting habitat for tundra swans and a wide variety of geese and ducks. Sandhill cranes and a variety of raptors,

grouse, and passerine birds utilize area habitats. Important fish in area rivers and lakes include salmon, arctic grayling, whitefish, northern pike, blackfish, and burbot.

Land Use

The majority of the area is still in natural vegetation and used primarily for subsistence hunting, fishing, and gathering by local residents. Forests accessible from the villages provide timber for local use. People from outside the MLRA use the area for hunting and wildland recreation.

The major soil resource management concern is flooding. Most communities are located on the banks of major rivers and streams where flooding is a severe hazard. Flooding is associated with spring snowmelt and runoff from adjacent mountains, ice jamming on rivers during break up, and occasionally from high intensity summer thunderstorms. On permafrost soils, disturbance of the insulating organic surface results in thawing of upper soil layers. This can result in ponding, soil subsidence, erosion, and disruption of surface drainage. All activities must consider the protection of the organic surface and the thermal balance of the soils.

233—Upper Kobuk and Koyukuk Hills and Valleys

Introduction

MLRA 233 is in the Interior Region of Alaska and includes nearly level lowlands, rolling uplands, and isolated hills and low mountains along the upper Kobuk River from approximately the confluence with the Pau River east to Kanuti Flats along the middle Koykukuk River (*Figure* 1). This MLRA makes up about 3,349,261 square kilometers. This area is primarily undeveloped wildlands and is sparsely populated. Principal communities in the area include the villages of Kobuk in the west and Bettles, Alatna, and Allakaket in the east. Federally administered lands include a major part of Gates of the Arctic National Park and Preserve and Kanuti National Wildlife Refuge.

Physiography

This area lies within the Western Alaska physiographic province of the Intermontane Uplands and Lowlands system (Wahrhaftig 1965). The terrain consists of broad, nearly level river valleys, shallow basins, and rolling uplands separated by isolated hills and low rounded mountains. In the river valleys, nearly level flood plains and stream terraces gradually give rise to gently sloping to moderately steep slopes leading to the hills and mountains. Extensive, nearly level to undulating basins include the Pau River Flats between the eastern Zane and Lockwood Hills, Kanuti Flats between the Kanuti and Koyukuk Rivers, and along the middle reaches of the Hogatzo River. Shallow basins and depressions on stream terraces are dotted with hundreds of lakes and interconnecting wetlands. Elevation ranges from about 150 feet (46 meters), in the west at the confluence of the Kobuk and Manueluk Rivers, to 4,765 feet (1,452 meters), at the summit of Fritts Mountain in the Angaycuham Mountains.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Northwest Alaska (1902), 50 percent and Yukon (1903), 50 percent. The western half of this MLRA drains into the Kobuk River and eventually Kotzebue Sound and the Chukchi Sea. Major tributaries of the Kobuk River include the Reed, Beaver, Manueluk, and Pau Rivers. The eastern half of this MLRA drains into the Koyukuk River and eventually the Yukon River and Bering Sea. Major tributaries of the Koyukuk River include the Alatna, John, and Kanuti Rivers. In addition to the complex of ponds and small lakes in basins and on stream terraces, there are a number of large lakes within and on the edge of the area. Principal lakes include Walker Lake, Nutuvukti Lake, Naruak Lake, and Lake Shelby. Lakes make up about 5 percent of the area.

This area is in the zone of discontinuous permafrost. Permafrost close to the surface is common in finer textured sediments throughout the area. Isolated masses of ground ice occur on terraces and lower sideslopes of hills. Permafrost is generally absent on flood plains and steep south-facing slopes. Periglacial features, such as pingos, thermokarst pits and mounds, ice wedge polygons, and earth hummocks are on lower slopes and upland valleys.

Geology

The northern portion of the area has been covered repeatedly by Pleistocene glaciers originating in the Brooks Range to the north. Lightly to highly modified moraines and drift cover much of the rolling uplands. Glacial ice also flowed over most hills and low mountains removing existing deposits and leaving a thin layer of glacial sediments. Today, lower mountain slopes, hills, and valley bottoms are covered with a variety of material including glacial drift, colluvium, slope alluvium, fluvial deposits, and silty loess. In the southern portion of the area, basins and valleys are filled with Quaternary glaciofluvial and fluvial deposits. Hills and upland slopes are covered with bedrock

colluvium and slope alluvium, mantled with loess in places. Bedrock geology underlying much of the area is predominantly Permian through lower Cretaceous stratified sedimentary and volcanic rocks.

Climate

Short, warm summers and long, cold winters characterize the subarctic continental climate of the area. The average annual precipitation ranges from 10 to 20 inches (254 to 508 millimeters), in valley bottoms and basins, to 20 to 40 inches (508 to 1,016 millimeters), at higher elevations in the hills and mountains. Most precipitation falls as rain between the months of May and September. The average annual snowfall ranges from about 65 to 80 inches (165 to 203 centimeters). The average annual temperature is about 20 to 22 degrees F (-6.7 to -5.6 degrees C). The average frost-free period ranges from less than 30 days to about 90 days. Normally, the temperature remains above freezing in river valleys and basins from mid-June through August.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 58 percent; Inceptisols, 23 percent; Entisols, 8 percent; other soil orders, 3 percent; and miscellaneous (nonsoil) areas, 8 percent. Area soils have a pergelic or cryic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. Aquiturbels and Haploturbels on stream terraces, hills, and upland slopes are formed in silty loess or alluvium over very gravelly loamy alluvium and glacial drift. These soils are shallow to moderately deep over permafrost and are poorly drained or very poorly drained. Hemistels are on peat plateaus, palsas, and depressions on hills and upland slopes. Fibristels are in sloughs and depressions on stream terraces and on the margins of lakes. All of the Gelisols are generally shallow to moderately deep over permafrost and poorly drained or very poorly drained. Wildfires can disturb the insulating organic surface, lowering the permafrost table and eliminating perched water tables from Gelisols, changing the classification. Depending on fire frequency, landform position, and particle size these soils may or may not revert back to Gelisols. Eutrocryepts, Dystrocryepts, and Cryorthents on upland slopes, shoulders and crests of hills, and occasionally stream terraces, are formed in silty loess over very gravelly loamy colluvium, glacial till, and alluvium. These soils lack permafrost within the soil profile and are deep and moderately well drained to excessively drained. Cryofluvents and Cryorthents on flood plains are formed in stratified loamy, sandy, and very gravelly alluvium. These soils range from very poorly drained to excessively drained. Common miscellaneous areas include surface bedrock on hill slopes and water.

Biological Resources

Forest vegetation on most sites consists primarily of open black spruce forests and black spruce woodland. Open white spruce forests and tall alder scrub with common white spruce are on active flood plains and steep mountain slopes with a southerly aspect. On drier sites and in areas of recent burns, paper birch and quaking aspen are found with black spruce. Lightning-caused wildfires are common, often burning many thousands of acres during a single fire. Following wildfires, willow, shrub birch, and ericaceous shrub scrub invade most sites until eventually being replaced by forest vegetation. On all forest and woodland sites, post-fire succession leads to a relatively rapid accumulation of organic matter and mosses on the surface. This causes a decrease in soil temperature, biologic activity, and nutrient availability, and a gradual decrease in site productivity. Non-forest vegetation includes low to tall willow, shrub birch, and ericaceous shrub scrub on peatlands, in drainageways, and above about 2,000 feet (600 meters) elevation. Moist sedge meadows, often with tussock forming sedges, are on nearly level uplands. Wet sedge

meadows and sedge-moss bog meadows are along the margins of lakes and on continuously ponded sites. Low to tall willow scrub with common balsam poplar are on low flood plains.

Common mammals in the area include brown bear, black bear, caribou, moose, wolf, beaver, and a variety of furbearers and small mammals. Area ponds and wetlands provide high quality habitat for tundra swans and other waterfowl. Bald eagles are common along most rivers. Arctic grayling, burbot, northern pike, sheefish, and whitefish are in area rivers and lakes.

Land Use

The majority of the area is still in natural vegetation and is primarily used by local residents for subsistence hunting, fishing, and gathering.

The major soil resource management concern is disturbance of the fragile permafrost soils. Disturbance of the insulating organic surface results in thawing of upper soil layers. This can result in ponding, soil subsidence, erosion, and disruption of surface drainage. All activities must consider the protection of the organic surface and the thermal balance of the soils.

234—Interior Brooks Range Mountains

Introduction

MLRA 234 is in the Interior Region of Alaska and includes the high mountains and valleys on the southern side of the Brooks Ranges that drain into the Yukon River system (*Figure* 1). This MLRA makes up about 4,992,881 square kilometers. This MLRA is almost entirely remote wildlands and is sparsely populated. The Dalton Highway (known locally as the Haul Road) bisects the Brooks Range at Atigun Pass. Anaktuvuk Pass and Arctic Village are two remote villages within this MLRA. Coldfoot, Wiseman, and Dietrich Camp along the Dalton Highway are the only other permanent settlements. Federally administered lands within this MLRA include extensive portions of the Gates of the Arctic National Park and Preserve and the Arctic National Wildlife Refuge.

Physiography

This area lies within the Arctic Mountains physiographic province of the Rocky Mountain system (Wahrhaftig 1965). The Brooks Range is the most northerly extension of the Rocky Mountains. The terrain consists predominantly of steep, rugged, high mountains and narrow, high gradient valleys. At upper elevations, the mountains are generally rocky and sharp ridged. Small glaciers occur at higher elevations in some places. Lower mountain slopes are characterized by coalescing alluvial and colluvial fans and steep footslopes, which frequently extend down and into the stream channels. Narrow, discontinuous flood plains are in wider, more gently sloping portions of the valleys. The valley bottoms of the larger rivers and streams have nearly level flood plains and stream terraces. Elevations range from about 1,600 feet (500 meters) to nearly 8,000 feet (2,400 meters).

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Yukon (1903), 100 percent. This MLRA drains entirely into the Yukon River system and the Bering Sea. Major rivers that have their headwaters in the area include Sheenjek, Chandalar, Koyukuk, John, and Alatna Rivers. Lakes make up less than 5 percent of the area.

This area is in the zone of discontinuous permafrost. Permafrost close to the surface is generally restricted to finer textured sediments on stream terraces and swales on hills and footslopes. Periglacial features include gelifluction lobes, polygons, and stripes.

Geology

During the early and middle Pleistocene epoch glacial ice buried most of the area. By the late Pleistocene epoch, only the highest valleys and mountains were still glaciated. Most glacial deposits have eroded away or been buried by mountain colluvium and slope alluvium, which accumulated during the Holocene epoch across about 95 percent of the landscape. Lightly to highly modified glacial moraines, drift, and outwash deposits occur occasionally on lower mountain slopes and in valleys at lower elevations. Flood plains, stream terraces, and alluvial fans have recent and Pleistocene fluvial deposits. Underlying bedrock geology consists almost entirely of stratified sedimentary rocks of Paleozoic and Precambrian age. In the east are inclusions of Paleozoic and early Jurassic volcanic and igneous rocks.

Climate

Short, cool summers and long, cold winters characterize the subarctic continental climate of the area. Strong winds are common at higher elevations in mountain valleys. The average annual precipitation ranges from about 10 to 15 inches (254 to 381 millimeters), in valley bottoms at lower elevations, to 20 to 30 inches (508 to 762 millimeters), at the highest elevations. The average annual snowfall is about 60 to 100 inches (152 to 254 centimeters). The average annual temperature ranges from 8 to 16 degrees F (-13 to -9 degrees C). The length of the frost-free period

is not known. Freezing temperatures can occur throughout the year and extended periods of extreme cold are common in most winters.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 21 percent; Entisols, 8 percent; Inceptisols, 6 percent; other soil orders, 2 percent; and miscellaneous (nonsoil) areas, 63 percent. Area soils have a pergelic or cryic soil temperature regime, a udic or aquic soil moisture regime, and mixed mineralogy. Histoturbels and Aquiturbels on lower mountain slopes, elongated footslopes, and stream terraces are formed in loamy to cobbly colluvium, slope alluvium, and fluvial deposits. Many also have a surface mineral layer of silty eolian loess. Histoturbels have a moderately thick surface layer of organic material. Molliturbells, Umbriturbels, and Haploturbels on mountain slopes, hill slopes, ridges, and fans are formed in loamy and gravelly colluvium over fractured bedrock and loamy glacial drift. Fibristels and Hemistels in depressions and lake margins are formed in thick organic material. Gelisols are shallow to moderately deep over permafrost and range from somewhat poorly drained to very poorly drained. Wildfires can disturb the insulating organic surface, lowering the permafrost table and eliminating perched water tables from Gelisols, changing the classification. Depending on fire frequency, landform position, and particle size these soils may or may not revert back to Gelisols. Cryorthents, Eutrocryepts, and Dystrocryepts on south-facing slopes and ridges in the foothills and in the bottoms of narrow, steep valleys are formed in loamy to very gravelly colluvium, fractured bedrock, and glacial drift. Cryofluvents and Cryorthents on flood plains and natural levees along streams are formed in loamy, sandy, and gravelly alluvium. Inceptisols and Entisols lack permafrost within the soil profile and range from excessively drained to poorly drained. Common miscellaneous areas include surface bedrock, rubble, talus, riverwash, and permanent ice and snow.

Biological Resources

Because of the shallow soils, high winds, and harsh climate vegetation cover is sparse and generally limited to valleys and lower mountain slopes. Dwarf scrub communities on mountain slopes and ridges are dominated by black crowberry, ericaceous shrubs, dryas, and dwarf willow. On thin rocky soils and exposed sites, lichens and scattered herbs dominate the ground layer. Bare soil and bedrock are generally extensive. On more mesic sites, sedges, forbs, and mosses cover most of the ground surface. The predominant vegetation at lower elevations and on deeper soils in basins and on terraces consists of white spruce and mixed spruce-hardwood forests and woodland, low willow and ericaceous shrub scrub, and mesic graminoid herbaceous communities. Black spruce woodlands, often with extensive areas of tussock forming sedges, are common on high stream terraces and mountain footslopes. In depressions, drainageways, and other saturated sites are wet sedge meadows and wet sedge-moss meadows. Low and tall willow scrub is the dominant vegetation on flood plains.

Common mammals in the area include brown bear, black bear, wolf, caribou, and Dall sheep. Smaller mammals include marmot, red fox, arctic fox, wolverine, ground squirrel, lemming, and pika. Common raptors in many areas include golden eagles, marsh hawks, and snowy owls.

Land Use

The majority of the area is still in natural vegetation and is primarily used by local residents for subsistence hunting, fishing, and gathering. The area is also used widely for sport hunting and wildland recreation. Most visitors are served by air taxi, guiding, and outfitting companies operating out of major Alaska communities. Mineral resources have been prospected and mined in a number of places. These include gold, silver, and copper. Construction and maintenance of the Dalton Highway has lead to development of sand and gravel pits along the road corridor.

X2—Western Alaska Region

This region is in Alaska. It occupies the western part of the state near the Bering Sea from the Alaska Peninsula and Bristol Bay lowlands to the southern Seward Peninsula. The region includes the northern Bering Sea islands (*Figure* 1). Elevation ranges from sea level to about 7,000 feet (2,135 meters). The region makes up 23,704,696 square kilometers.

Land use throughout the region includes reindeer herding, mining, wildlife habitat, and subsistence hunting, fishing, and gathering. The climate ranges from maritime, near the coast, to sub-arctic continental, away from the coast and at higher elevations. In the northern portion of the region the winter climate becomes more continental as the ice pack forms in the Bering Sea. Summers are short and warm and winters are long and cold. Cloudy conditions are common along the coast in summer. The annual precipitation across the region ranges from about 13 to 80 inches (330 to 2,032 millimeters). Precipitation is lowest in lowland areas and the Nulato Hills and increases markedly at higher elevations of the Ahklun and Alaska Peninsula mountains. The annual temperature ranges from 25 to 40 degrees F (-3.9 to 4.4 degrees C), with the most variation in the mountainous areas. Frost may occur in any month. Strong winds, especially in the winter, are common. Snow covers the ground for approximately 7 to 9 months.

The region consists of diverse landforms, including mountains, hills, coastal plains, outwash plains, stream terraces, volcanic cinder cones, and dunes. The Ahklun, Killbuck, and Alaska Peninsula mountains are generally steep and rugged. Rolling hills, low mountains, and broad valleys characterize the Nulato Hills, Seward Peninsula, and northern Bering Sea islands. Most of the remainder of the region consists of coastal lowlands and rolling uplands. Lakes and

interconnecting wetlands cover as much as 80 percent of the coastal lowlands. Permafrost is discontinuous across the region. Permafrost is prevalent on coastal plains, terraces, and footslopes, but normally is not on steep slopes and floodplains. Patterned ground and gelifluction lobes are common in many of the permafrost-affected areas.

Gelisols, soils with permafrost in the profile, occur throughout the region and comprise about 45 percent of the soil types. Orthels and Turbels are on level to sloping coastal plains and terraces, as well as on footslopes and in swales in the hills and mountains. Mollorthels and Molliturbels are typical in the limestone uplands of the northern Bering Sea islands. Most of the depressional areas throughout the region contain Histels. Coarse textured Cryepts and Cryolls, all with pergelic temperature regimes but without permafrost, occur on steep slopes in the mountainous areas. Similar soils with cryic temperature regimes are on well drained positions on moraines and outwash plains. Cryands are occur where volcanic ash and loess have mantled older landforms, and also along the flanks of cinder cones. Well drained Cryods are scattered throughout the region on upland landforms. Fluvents occur along floodplains and levees and Psamments occur where there are dunes.

The predominant vegetation across most of the region is arctic tundra and alpine tundra dominated by low and dwarf scrub and herbaceous communities. Tussock tundra occurs across broad expanses of uplands. Wet sedge and sedge-grass meadows, sedge-moss meadows, and sedge-shrub meadows are on coastal wetlands and poorly drained areas in drainageways. Of limited extent in valley bottoms, on well drained soils at lower elevations, are open forests and woodland of white and black spruce and, in places, paper birch and balsam poplar. Low and tall scrub, dominated by alder and willow, is common on mid-mountain slopes and flood plains.

235—Northern Alaska Peninsula Mountains

Introduction

MLRA 235 is in the Western Region of Alaska and includes the northwest-facing slopes of the southern Aleutian Mountains that drain into the Bristol Bay-Northern Alaska Peninsula Lowlands (MLRA 236) and Bristol Bay. It makes up about 1,483,068 square kilometers. MLRA 235 is mostly undeveloped wildlands and is sparsely populated. The only permanent settlements in the area are several small villages and remote recreational lodges. Federally administered lands within this MLRA include parts of Katmai National Park and Preserve, Alaska Peninsula National Wildlife Refuge, and Becharof National Wildlife Refuge.

Physiography

This area lies within the Alaska-Aleutian physiographic province of the Pacific Mountain system (Wahrhaftig 1965). The terrain consists primarily of rugged, low to moderately high mountains deeply dissected with narrow, high gradient valleys. On the highest peaks in the area, glaciers and small ice fields are common at upper elevations. Glaciers and permanent ice and snow make up about 2 percent of the area. In steep, narrow valleys, coalescing fans, footslopes, and small stream channels are contiguous downslope. At lower elevations along the boundary with the Bristol Bay-Northern Alaska Peninsula Lowlands (MLRA 236) flood plains and stream terraces are common in valley bottoms. Elevation ranges from about 14 feet (4 meters) along the shoreline of Becharof Lake, to over 7,000 feet (2,135 meters) at the summits of Mt. Veniaminof and Mt. Douglas.

The extent of major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Southwest Alaska (1904), 100 percent. This MLRA drains into the Bristol Bay-Northern Alaska Peninsula Lowlands (MLRA 236) via numerous short, high gradient streams and creeks that originate in the high basins and glaciers of the mountains. Headwaters of the Kvichak, Naknek, King Salmon, and Egegik Rivers originate within this MLRA. Lakes make up about 3 percent of the area.

Geology

Except for the highest peaks and steep upper elevation ridges, the entire area was covered in glacial ice during the late Pleistocene epoch. During the Holocene epoch, glacial deposits across much of the area eroded away or were buried by colluvium and slope alluvium. Mountain colluvium and alluvium covers about 50 percent of the present landscape. Lightly modified glacial moraines and drift and scattered glaciofluvial deposits are extensive on lower mountain slopes and in valleys at lower elevations. Volcanic activity on Mt. Katmai and other volcanoes on the lower Alaska Peninsula and Aleutian Islands have deposited a layer of volcanic ash across much of the lower elevation landscape. The predominant geologic formations underlying most of the area are upper Jurassic and some Cretaceous and lower Tertiary stratified sedimentary rocks. Jurassic intrusive rocks and Tertiary and Quaternary volcanic rocks are common locally, particularly in the vicinity of volcanoes.

Climate

Maritime conditions of Bristol Bay and the Bering Sea to the west, spillover effects from the North Pacific to the southeast, and the orographic effects of the rugged mountainous environment, influence the climate of this area. Summers are short, cool, and frequently cloudy and rainy.

Winters are long and cold, generally with deep snowfall. Windy conditions are common year round. The average annual precipitation ranges from 30 inches, at lower elevations, to greater than 100 inches, (762 to 2,540 millimeters), at higher elevations. The average annual snowfall is about 50 to 200 inches (127 to 508 centimeters). The average annual temperature and length of the frost-free season is not known. Freezing temperatures are likely to occur during any month of the year, particularly at higher elevations.

Soils

The approximate extent of the soil orders and nonsoil areas in this MLRA is as follows: Andisols, 48 percent; Histosols, 5 percent; other soil orders, 4 percent; and miscellaneous (nonsoil) areas, 43 percent. Area soils have a cryic or pergelic soil temperature regime, a udic or aquic soil moisture regime, and mixed mineralogy. Haplocryands on lower elevation mountain slopes, fans, and stream terraces are formed in a moderately thick to thick layer of silty volcanic ash over various materials, including loamy, gravelly, and cobbly colluvium, glacial drift, and slope alluvium. Haplocryands on upper mountain slopes and ridges are formed in a thin to moderately thick layer of volcanic ash over cobbly colluvium and slope alluvium over bedrock residuum. These soils are mostly well drained. Cryofibrists in valley bottoms and depressions are formed in thick organic deposits. These soils are poorly drained or very poorly drained. Common miscellaneous areas include riverwash, rock outcrop, rubble, talus, and permanent ice and snow.

Biological Resources

At lower elevations, the vegetation is mostly tall scrub dominated by alder and willow. Balsam poplar forests, with tall shrub and herbaceous understory, are on flood plains and some south-facing mountain slopes. With increasing elevation, tall scrub rapidly gives way to low scrub dominated by willow, ericaceous shrubs, and various graminoids and forbs. Bluejoint reedgrass grasslands are scattered throughout the scrub. At the highest elevations and on exposed ridges and steep slopes with shallow bedrock, dwarf scrub is the dominant vegetation. Crowberry, ericaceous shrubs, willow, bryophytes, and lichens usually dominate dwarf shrub communities. Poorly drained areas and peatlands support low scrub and sedge-grass meadows.

Some of the major mammal species of the area include brown bear, Dall sheep, moose, wolf, and coyote. Ptarmigan, American golden plovers, golden eagles, and a wide variety of other birds are common in many places.

Land Use

This area is mostly remote wildlands and primarily used for recreation. Most visitors are served by air taxi, guiding, and outfitting companies operating out of major Alaska communities. Subsistence hunting, fishing, and gathering provide food and a variety of other resources for local residents.

236—Bristol Bay-Northern Alaska Peninsula Lowlands

Introduction

MLRA 236 is in the Western Region of Alaska and includes the nearly level to rolling lowlands, uplands, and isolated hills adjacent to Bristol Bay. This MLRA makes up about 5,089,521 square kilometers). The area is mostly undeveloped wildlands and is sparsely populated. Principal communities include Dillingham, Naknek, and King Salmon. Numerous other villages are scattered throughout the MLRA, primarily along major rivers and the shoreline of lakes. Federally administered lands in this MLRA include parts of Katmai and Aniakchak National Parks and Preserves and Alaska Peninsula, Becharof, Tokiak, and Alaska Maritime National Wildlife Refuges.

Physiography

This area lies within the Western Alaska province of the Intermontane Uplands and Lowlands. The terrain consists predominantly of a broad expanse of gently sloping to rolling plains and low to moderate relief hills bordered by moderately sloping, elongated mountain footslopes. Depressions and shallow basins on terraces and plains are dotted with small to medium-sized lakes and interconnecting stream channels and wetlands. To the west, along the border of the Ahklun Mountains (MLRA 237), and to the east along the border with the Northern Alaska Peninsula Mountains (MLRA 235), large lakes contained behind terminal moraines extend from the mountain valleys out into the plains. Along the major rivers in the central portion of the area are narrow, low gradient, meandering flood plains and low stream terraces. In the southwest, short, high gradient rivers and streams originating in the adjacent mountains have formed broad, braided alluvial fans and flood plains. Isolated hills and rounded, low relief mountains are scattered throughout the inland portion of the area. Elevation ranges from sea level along the coast of Bristol Bay, to about 2,500 feet (762 meters) in the mountains.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Southwest Alaska region (1904), 100 percent. This MLRA drains entirely into Bristol Bay. The major rivers include the Egegik, Kvichak, Mulchatna, Naknek, Nushagak, Ugasik, and Wood Rivers. Most of the rivers and streams are meandering. Large lakes in the Aleutian Range include Lake Grosvenor and Iliamna, Kukaklek, Nonvainuk, Naknek, and Becharof Lakes. In the west along the Ahklun Mountains is the Wood-Tikchik Lakes system. Lakes make up about 10 percent of the area.

The area is within the zone of discontinuous permafrost. Permafrost is generally at a considerable depth below the surface and occurs primarily in finer textured materials on stream terraces, rolling uplands, and gently sloping footslopes. Isolated masses of ground ice are occasionally in glacial drift and other unconsolidated materials. Permafrost is generally absent on flood plains, near the coast, and in the southern portion of the area.

Geology

During the early to middle Pleistocene epoch, the entire area was covered in glacial ice originating in the Aleutian Range to the east and the Ahklun Mountains to the west. Little glaciation remained by the late Pleistocene, except possibly in higher hills and foothills near the mountains. Today, Pleistocene age moraines, drift, and glaciofluvial deposits cover approximately 60 percent of the area. Elsewhere, mixed Holocene and Pleistocene fluvial and coastal deposits predominate. Interlayered alluvial and marine sediments occur on the Nushagak Peninsula in the west and coastal areas in the east and south. Much of the area has been mantled with a layer of silty volcanic

ash and loess of varying thickness from regional volcanoes and nonvegetated flood plains and outwash plains. Underlying bedrock geology consists primarily of Tertiary and Quaternary stratified sedimentary rocks. Tertiary volcanic rocks are of minor extent in scattered locations near the Aleutian Mountains.

Climate

The climate of this area is strongly maritime near the coast of Bistrol Bay. Continental weather systems from Interior Alaska probably have a significant influence further inland, particularly in the winter. Summers are short and warm. Cloudy conditions and rain are common in summer. Winters are long and cold. The average annual precipitation is 13 to 50 inches (330 to 1,270 millimeters). The average annual snowfall is about 30 to 80 inches (76 to 203 centimeters). The average annual temperature ranges from 30 to 36 degrees F (-1.1 to 2.2 degrees C). The frost-free period is about 70 to 125 days.

Soils

The approximate extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 34 percent; Andisols and andic subgroups of Spodosols, 32 percent; Histosols, 13 percent; Inceptisols, 4 percent; Entisols, 3 percent; and miscellaneous (nonsoil) areas, 14 percent. Area soils have a cryic or pergelic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. Histoturbels and Aquiturbels on stream terraces and plains are formed in loamy, sandy, and gravelly fluvial sediments. Many also have a thin to moderately thick surface mineral layer of silty volcanic ash and loess. Fibristels, which are generally in depressions and shallow basins, are formed in thick organic materials. Gelisols in this area are shallow to moderately deep to permafrost and poorly drained or very poorly drained. Haplocryands, Haplocryods, Humicryods, and Dystrocryepts, on rolling uplands and footslopes along the boundary with adjacent mountains, are formed in a moderately thick to thick layer of silty volcanic ash over various glacial, fluvial, and colluvial sediments. Andisols and Spodosols lack permafrost within the soil profile and are generally deep and moderately well drained or well drained. Cryofluvents and Cryaquents on flood plains, low stream terraces, and alluvial fans are formed in stratified loamy, sandy, and gravelly alluvium. These soils are deep and range from poorly drained to excessively drained. Common miscellaneous areas include water, riverwash (particularly in the southwest), tidal flats, and beaches.

Biological Resources

On moderately well drained soils on plains and rolling uplands the dominant vegetation types are low and dwarf scrub, dominated by ericaceous shrubs, herbs, and often lichens and mosses. On somewhat poorly drained soils in bogs and other peatlands, vegetation is predominantly low and dwarf scrub, dominated by shrub birch, ericaceous shrubs, tussock forming sedges, and a thick, continuous layer of mosses. Poorly drained lowlands, fens, and lake margins are vegetated with wet herbaceous communities, including sedge marshes, sedge and sedge-moss meadows, and near the coast, halophytic sedge meadows. Balsam poplar and mixed balsam poplar-white spruce forest communities, typically with an understory of tall and low shrubs, are on flood plains of major rivers. Dwarf alpine scrub, lichens, and barren ground are on convex slopes and ridges at the higher elevations of isolated hills and mountains.

Common mammals in the area include brown bear, black bear, wolf, wolverine, caribou, moose, and a variety of other furbearers. The lowland areas contain good quality waterfowl habitat. Many species of migratory waterfowl use the lowlands as a staging and nesting area. Nearly the entire population of Pacific black brant, numbering a quarter of a million birds, and most of the world's

population of the emperor goose use coastal lagoons and wetlands in the area during their spring and fall migrations. Canada geese, ducks, tundra swans, and sandhill cranes also are common in the area. Many millions of shorebirds use the same habitats and flyways as the migrating waterfowl. Most rivers and streams are important spawning areas for salmon, which provide world class sport fishing during the summer and fall for visitors and local residents. Many streams and lakes support rainbow trout. Introduced northern pike, a major predator of small salmon and other more desirable fish, as well as waterfowl, are in many area lakes.

Land Use

Commercial fishing in Bristol Bay and the Bering Sea is the primary industrial use of the area. Most coastal communities support a fleet of boats and related fishing facilities. Many also have fish processing plants. Most inland areas are still in natural vegetation and are used primarily by local residents for subsistence hunting, fishing, and gathering. The Mulchatna caribou herd uses the area and attracts subsistence and sport hunters from around Alaska and elsewhere. Wilderness recreation and sport fishing are increasingly popular land uses. Most visitors are served by air taxi and guiding services out of Dillingham, King Salmon, and other communities and guest lodges in the area.

The major soil resource management concern is disturbance of the fragile permafrost soils. Disturbance of the insulating organic surface results in thawing of upper soil layers. This can result in ponding, soil subsidence, erosion, and disruption of surface drainage. All activities must consider the protection of the organic surface and the thermal balance of the soils.

237—Ahklun Mountains

Introduction

MLRA 237 is in the Western Region of Alaska and includes the mountains, hills, and valleys of the Ahklun and Kilbuck Mountains. Hagemeister Island and the Walrus Islands in Bristol Bay are included in this MLRA. This MLRA makes up about 3,768,202 square kilometers. This MLRA is primarily undeveloped wildlands and is sparsely populated. Principal communities in the area, which are located mostly along the coast of Bristol Bay and Kuskokwim Bay in the southwest, include Goodnews Bay, Manokotak, and Togiak. Federally administrated lands within this MLRA include parts of the Togiak, Yukon Delta, and Alaska Maritime National Wildlife Refuges.

Physiography

This area lies within the Ahklun Mountains physiographic province of the Intermontane Uplands and Lowlands system (Wahrhaftig 1965). The terrain consists of steep, rugged, low mountains cut throughout with narrow to broad valleys. Flood plains and terraces are common at lower elevations in the valleys of larger rivers. Alluvial and colluvial fans and steep mountain footslopes are common valley features throughout the area. Along the coast, where the Togiak and Goodnews Rivers empty into the Bering Sea, are nearly level to rolling deltas dotted with numerous small lakes. To the east, along the border with the Bristol Bay-Northern Alaska Peninsula Lowlands (MLRA 236), are deep, east-west oriented, glacially carved valleys that contain the Wood-Tikchik Lakes. Elevation ranges from sea level, along the Bering Sea coast in the south, to 4,658 feet (1,420 meters), at the summit of Mt. Oratia.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Southwest Alaska (1904), 100 percent. This area drains entirely into the Bering Sea by numerous rivers emptying directly into the Bering Sea or into the Wood-Tikchik Lakes to the east and Kuskokwim River to the north and west. The major rivers include the Goodnews, Togiak, Kanektok, Osviak, Eek, and Arolik Rivers. Lakes make up about 5 percent of the area.

This area is in the zone of discontinuous permafrost. In the mountains, isolated masses of permafrost are in areas of deep unconsolidated deposits. In lowland areas, permafrost occurs as isolated masses primarily in finer textured materials. Permafrost is generally absent on flood plains and near the coast.

Geology

Throughout the Pleistocene epoch, all of the Ahklun Mountains were extensively glaciated, except for possibly the higher peaks and upper elevation ridges. The Kilbuck Mountains were unglaciated. Coastal lowlands were generally ice-free by the late Pleistocene. During the Holocene epoch, colluvium and slope alluvium accumulated across about 40 percent of the area. Glacial moraines and drift still cover approximately 45 percent of the area, primarily on lower mountain slopes, valley bottoms, and coastal plains. Recent alluvial deposits are on flood plains and on interlayered alluvial and marine deposits in coastal lowlands. Bedrock geology underlying most of the area is predominantly Jurassic and Cretaceous stratified, sedimentary rocks. Less common are Paleozoic sedimentary rocks. Scattered throughout the area are exposed volcanic intrusive rocks that impart a ring-like structure to some of the isolated mountain groups. Volcanic rocks are more common in the Kilbuck Mountains. The area is cut by numerous northeast trending faults.

Climate

The climate of this area is under both maritime and continental influences, depending on the time of year and proximity to the coast of Bristol Bay and the Bering Sea. Orographic effects and other mountainous influences are also likely important. Summers are short and variable. Winters are long and cold. The average annual precipitation ranges from 20 to 30 inches (508 to 762 millimeters) in the lower elevations, to 50 inches (1,270 millimeters) or more in the higher elevations. The average annual snowfall ranges from about 80 to 200 inches (127 to 508 centimeters). The average annual temperature along the coast is about 33 degrees F (0.5 degrees C). The length of the frost-free period along the coast is 110 to 135 days.

Soils

The approximate extent of soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 30 percent; Inceptisols, 26 percent; Spodosols, 16 percent; Andisols, 2 percent; Entisols and other soil orders, 1 percent; and miscellaneous (nonsoil) areas, 25 percent. Area soils have a cryic or pergelic soil temperature regime, an aquic or ustic soil moisture regime, and mixed mineralogy. Dystrocryepts and Haplocryods are on ridges, steep mountain slopes, hills, fans, footslopes, and plains. They are formed in gravelly colluvium and slope alluvium. At higher elevations, fractured bedrock is at shallow to moderate depths in many soils. At lower elevations, Andisols and andic subgroups of other orders have a thin to moderately thick surface layer of silty volcanic ash and loess. These soils range from shallow to deep and are generally well drained. Histoturbels and Aquiturbels are in swales and depressions on hills, seepage areas, footslopes and stream terraces. They are formed in various colluvial and alluvial deposits and are somewhat poorly drained or very poorly drained. Histoturbels have a moderately thick surface layer of organic material. Fibristels in depressions and shallow basins on stream terraces are formed in deep thick organic materials. Gelisols are shallow to moderately deep to permafrost and poorly drained or very poorly drained. Cryaquents and Cryofluvents on flood plains, low stream terraces, and river deltas are formed in stratified silty and sandy alluvium, often with a substratum of gravelly and cobbly alluvium. These soils are deep and range from excessively drained to poorly drained. Many of these soils also have an upper mineral layer of silty volcanic ash, loess, or an admixture of the two. Common miscellaneous areas include surface bedrock, rubble, talus, riverwash, water, tidal flats, and beaches.

Biological Resources

On well drained soils on mountain slopes at low and middle elevations, the predominant vegetation is tall alder shrub, tall and low willow scrub, and low ericaceous scrub. On peatlands and moderately well drained mineral soils, low ericaceous shrub and shrub birch scrub occur, with tussock forming sedges or various sedges and grasses in the ground layer. Wet sedge meadows, sedge-grass meadows, and sedge-moss meadows are in drainages and along lakeshores. At lower elevations on well drained soils in valley bottoms, are balsam poplar, white spruce, and mixed balsam poplar-white spruce forests. Balsam poplar and mixed forest types usually have an understory of tall and low shrubs and herbs. Spruce forest understory is often dominated by a nearly continuous layer of feather mosses, with only scattered shrubs and herbs. At higher elevations and on shallow soils on convex mountain slopes and ridges, dwarf alpine scrub dominated by ericaceous shrubs, dryas, and shrub birch is the common vegetation. These communities often have considerable lichen cover and bare ground.

Major mammals inhabiting the area include brown bear, black bear, moose, wolf, wolverine, caribou, and various furbearers. Walrus, spotted seals, and fur seals are in coastal areas. The sea

cliffs are important nesting habitat for murres, kittiwakes, fulmars and cormorants. At lower elevations, most rivers and streams in the area are important spawning areas for salmon.

Land Use

Local residents primarily use this remote area for subsistence hunting, fishing, and gathering. A number of extractable minerals and other commodities have been mined in the area in the past, however, most mines have ceased operations. Wildland recreation is an increasingly important land use, particularly in the Wood-Tikchik Lakes area.

238—Yukon-Kuskokwim Coastal Plain

Introduction

MLRA 238 is in the Western Region of Alaska and consists of the broad, nearly level delta along the lower reaches of the Yukon and Kuskokwim Rivers where they empty into the Bering Sea. This MLRA makes up about 7,788,280 square kilometers. Although the area is mostly undeveloped wildlands and is sparsely populated, there are approximately 42 villages scattered along the coast or the banks of the Yukon and Kuskokwim Rivers. Principal communities include Aniak, Bethel, Hooper Bay, St. Mary's, and Emmonak. This MLRA falls entirely within the Yukon Delta National Wildlife Refuge. A few of the area's small coastal islands are included within the Alaska Maritime National Wildlife Refuge.

Physiography

This area lies within the Bering Shelf province of the Intermontane Uplands and Lowlands. The terrain consists of a level to rolling delta plain along the lower reaches of the Yukon and Kuskokwim Rivers. In a few locations, isolated low hills protrude above the surrounding plain. The Yukon River runs along the northern edge of the area and the Kuskokwim River runs across the southern edge. The area is crossed with numerous low gradient streams, many of which are tributaries or former channels of the Yukon or Kuskokwim Rivers. Depressions and shallow basins on the plain are dotted with interconnecting stream channels, wetlands, and thousands of small to medium-sized lakes. Flood plain features include low escarpments, meander scars, oxbow lakes, sloughs, and multiple channels and islands. The coastline is broken by a number of large inlets and bays. Baird Inlet forms a large inland sea behind Nelson Island. Across the majority of the area, elevation ranges from sea level to about 300 feet (91 meters). However, the elevation at the summit of Towak Mountain on Cape Romanzof is 2,342 feet (710 meters).

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Yukon (1903), 50 percent and Southwest Alaska (1904), 50 percent. The vast majority of interior and western Alaska drains into the Bering Sea through this MLRA. Major rivers in addition to the Yukon and Kuskokwim are the Black, Azun, Kashimuk, and Izaviknek Rivers. Lakes make up about 40 percent of the area.

The area is in the zone of discontinuous permafrost. Permafrost is thin to moderately thick and occurs primarily in fine textured deposits. Maximum depth to the bottom of the permafrost is about 600 feet (181 meters). Permafrost is generally absent on flood plains and areas near bodies of water.

Geology

The area was unglaciated during the Pleistocene epoch, except possibly along the extreme southeast edge where mountain glaciers from the Ahklun Mountains extended a small distance down onto the lowlands. Sediments across the vast majority of the area consists of fine textured, Holocene and Pleistocene deltaic deposits from the Yukon and Kuskokwim Rivers and loamy and sandy textured, Holocene fluvial deposits on flood plains and stream terraces. Scattered throughout the western portion of the area are a number of low basalt hills and associated cinder cones and volcanic craters. These features date to the Cretaceous and Tertiary period and are mantled by Holocene colluvium.

Climate

The climate of the area is primarily maritime. However, in winter when the Bering Sea ice pack has formed, the climate becomes more continental. Summers are short and variable with cloudy and rainy conditions common. Winters are long and cold. Windy conditions are common at any time of year. Fog and poor visibility is common, particularly in coastal areas during the winter. The average annual precipitation is 15 to 30 inches (381 to 762 millimeters). The average annual snowfall ranges from about 40 to 90 inches (102 to 229 centimeters). The average annual temperature is 29 to 33 degrees F (-1.7 to 0.6 degrees C). The average frost-free period is about 80 to 135 days. Frosts may occur in any month, but June through August are generally frost-free.

Soils

The approximate extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 51 percent; Inceptisols, 3 percent; Entisols, 3 percent; other soil orders, 3 percent; and miscellaneous (nonsoil) areas, 40 percent. Area soils have a pergelic or cryic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. Fibristels, Hemistels, Histoturbels, and Aquiturbels are the common soils across the broad expanse of the delta. Fibristels and Hemistels in depressions and shallow basins are formed in thick organic materials over shallow to moderately deep permafrost. Fibristels and Hemistels are very poorly drained. Mineral soil material, if present, is usually within the permafrost layer. Historturbels are common soils on elevated and convex positions. Histoturbels are formed in a moderately thick layer of organic material over silty and loamy fluvial sediments. Aquiturbels on low terraces and in drainageways are formed in stratified silty and sandy alluvial sediments. Histoturbels and Aquiturbels are generally shallow to moderately deep to permafrost and very poorly drained to moderately well drained. Dystocryepts on hills and elevated ridges are formed in silty and sandy fluvial sediments. Cryofluvents on flood plains are formed in silty and sandy alluvium. Excessively drained Cryopsamments on coastal dunes are formed in deep deposits of sand. Very poorly drained Cryofibrists and Cryohemists on lakeshores are formed in thick deposits of organic materials. Inceptisols, Entisols, and Histosols lack permafrost within the soil profile. Common miscellaneous areas include water, tidal flats, and beaches.

Biological Resources

Lakes, ponds, and other surface water are present throughout the majority of the area. Vegetation near these bodies of water includes wet sedge meadows, sedge-shrub meadows, and sedge-moss meadows. On peat mounds and other low uplands are low and dwarf scrub dominated by ericaceous shrubs, tussock forming sedges, other hydrophytic plants, and mosses. Sites with better drainage and higher local relief support low ericaceous scrub with mosses, lichens, low willows, and forbs. Dense stands of grasses grow on beds of drained thaw lakes. In the southern and eastern portions of the area, spruce forests and woodland occur on well drained floodplains and better drained uplands. Both white and black spruce are common. Low ericaceous shrubs, willow, alder, and mosses are dominant in the understory.

Common area mammals include brown bear, black bear, wolf, caribou, and various furbearers. Walrus and seals are in some coastal areas. The majority of this MLRA contains good quality waterfowl habitat and every year as many as 750,000 swans and geese use the lowlands as a staging and nesting area. Over 220 bird species use this MLRA at various times throughout the year. Among the significant species nesting in the area are tundra swans, emperor geese, black brants, spectacled eiders, bristle thighed curlews, white wagtails, dovekies, and McKays buntings. Approximately 75 percent of Alaska’s sandhill cranes breed in this MLRA.

Land Use

Local residents use this remote area primarily for subsistence hunting, fishing, and gathering.

The major soil resource management concern is disturbance of the fragile permafrost soils. Disturbance of the insulating organic surface results in thawing of upper soil layers. This can result in ponding, soil subsidence, erosion, and disruption of surface drainage. All activities must consider the protection of the organic surface and the thermal balance of the soils.

239—Northern Bering Sea Islands

Introduction

MLRA 239 is in the Western Region of Alaska and includes St. Lawrence, St. Matthew, and Nunivak Islands and a number of smaller islands of the northern Bering Sea. This MLRA makes up about 929,945 square kilometers. Major villages within this MLRA include Savoonga and Gambell on St. Lawrence Island and Mekoryuk on Nunivak Island. All of St. Matthew Island and a few small islands along the coast of St. Lawrence Island are included within the Alaska Maritime National Wildlife Refuge. Much of Nunivak Island is included within the Yukon Delta National Wildlife Refuge.

Physiography

This area lies within the Bering Shelf physiographic province of the Intermontane Uplands and Lowlands system (Wahrhaftig 1965). The terrain consists of nearly level to rolling plains and highlands with mostly gentle slopes. Steep, low relief volcanic cones, vents, and lava flows are common throughout Nunivak Island and occasional on St. Lawrence Island. Coastal lowlands dotted with numerous small to medium-sized lakes make up a significant portion of St. Lawrence Island. Along many stretches of the coast are narrow, discontinuous sand dunes and sand sheets. Elevation ranges from sea level, along the coast, to 2,207 feet (669 meters), at the summit of Atuk Mountain on St. Lawrence Island.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Northwest Alaska (1902), 50 percent and Southwest Alaska (1904), 50 percent. Numerous short, high gradient streams drain the islands of this MLRA directly into the Bering Sea. On St. Lawrence Island, lakes make up about 10 percent of the area. Lakes are less extensive on Nunivak and St. Matthew Islands.

The area is in the zone of discontinuous permafrost. Permafrost is generally thin to moderately thick and primarily in fine textured deposits. Permafrost is generally absent on flood plains, in coarse textured sediments on steep slopes of volcanic cones, and along the coast. Permafrost is also generally absent in proximity to lakes and other bodies of water. Common periglacial features in the area include solifluction lobes, frost boils, and patterned ground on plains, footslopes, and in swales on hills.

Geology

The Northern Bering Sea Islands rise from the submarine Bering platform. St. Lawrence Island is the most geologically complex of the islands. It is composed primarily of Cretaceous, Tertiary, and Quaternary volcanic rocks and some Paleozoic stratified sedimentary rocks. Coastal lowlands are composed mostly of Quaternary alluvial and marine sediments. Nunivak and St. Matthew Islands are composed almost exclusively of Tertiary and Quaternary volcanic rocks. With the possible exception of a small area on the western end of St. Lawrence Island, the area was unglaciated during the Pleistocene epoch. Most of the modern landscape is mantled with Quaternary alluvial, marine and eolian deposits.

Climate

The climate of the area is maritime much of the year and strongly continental in winter when the Bering Sea ice pack has formed. Summers are short and cool. Winters are long and cold. Cloudy, foggy, and rainy conditions are common in the summer. Strong winds are common throughout the year. The average annual precipitation is 10 to 25 inches (254 to 635 millimeters). The average snowfall is about 50 to 80 inches (127 to 203 centimeters). The average annual temperature at

Gambell on St. Lawrence Island is 25 degrees F (-3.9 degrees C). The average frost-free period at Gambell is about 60 to 90 days.

Soils

The approximate extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 80 percent; Mollisols, 5 percent; Inceptisols, 4 percent; other soil orders, 1 percent; and miscellaneous (nonsoil) areas, 10 percent. Area soils have a pergelic or cryic soil temperature regime, an aquic, ustic, or udic soil moisture regime, and mixed mineralogy. Histoturbels and Aquiturbels on plains, hills, and lower mountain slopes, are formed in gravelly and sandy materials. Historthels on the same landforms have a moderately thick surface layer of organic material. These soils are shallow to moderately deep to permafrost and poorly drained to somewhat poorly drained. Dystrocryepts on these same landforms and formed in similar materials lack permafrost within the soil profile and are generally well drained. Fibristels and Hemistels in depressions and swales on plains and hills are formed in thick organic materials, are also shallow to moderately deep over permafrost, and are poorly drained. On limestone uplands Mollorthels, Molliturbels, and Haplocryolls form in residuum. Mollorthels and Molliturbels are shallow to moderately deep over permafrost and somewhat poorly drained or poorly drained. Haplocryolls lack permafrost within the soil profile and are mostly well drained. Common miscellaneous areas include water, lava fields, rubble consisting of volcanic rocks, sandy and gravelly beaches, and sea cliffs.

Biological Resources

The predominant vegetation on peatlands, gentle mountain slopes, plains, and deeper soils is low and dwarf scrub and sedge-shrub meadows dominated by black crowberry, ericaceous shrubs, sedges, tussock forming sedges, and a variety of forbs and mosses. On shallow soils on convex mountain slopes and ridges, dwarf alpine scrub dominated by ericaceous shrubs, dryas, and dwarf willows is the common vegetation. These communities often have considerable lichen cover and bare ground. Bedrock exposures with lichens and scattered shrubs and herbs in pockets of fine earth dominate the highest elevations and ridges and other wind blown sites. In drainages and along the shore of lakes are wet sedge meadows, sedge-grass meadows, and sedge-moss meadows. On well drained flood plains, low to tall willow scrub with dense grass and forb cover in the understory is common.

A variety of marine mammals and seabirds inhabit the coastal waters, rocky shorelines, and sea cliffs of the area. Waterfowl nest in coastal lowlands. Common marine mammals include northern fur seals, ribbon seals, sea lions, and walrus. Seabirds include eiders, cormorants, kittiwakes, puffins, auklets, oldsquaw, and murres. In winter, flocks of rare spectacled eiders congregate in openings in the sea ice south of St. Lawrence Island. Caribou, reindeer, musk ox, arctic fox, and other small mammals are on many islands.

Land Use

Local residents use this remote area primarily for subsistence hunting, fishing, and gathering. Reindeer herding on Nunivak Island and St. Lawrence Island provide meat and other products to residents of the region. Tourism and wildland recreation is a small but increasing land use.

The major soil resource management concerns relate to disturbance of the fragile permafrost soils, and erosion of andic soils and soils on steep slopes. Disturbance of the insulating organic surface results in thawing of upper soil layers. This can result in ponding, soil subsidence, erosion, and disruption of surface drainage. All activities must consider the protection of the organic surface and the thermal balance of the soils.

240—Nulato Hills-Southern Seward Peninsula Highlands

Introduction

MLRA 240 is in the Western Region of Alaska and consists primarily of the rolling hills, low mountains, and valleys of the southern Seward Peninsula and western slopes of the Nulato Hills. This MLRA makes up about 4,645,680 square kilometers. This area is primarily undeveloped wildlands and is sparsely populated. Principal communities in the area are Nome and Unalakleet. A number of other small villages are along the coast of Norton Sound or the banks of major rivers. Roads connect Nome with the villages of Council, to the east, the central Seward Peninsula, to the north, and Teller, to the northwest. Federally administered land within this MLRA includes part of the Yukon Delta National Wildlife Refuge.

Physiography

This area lies within the Seward Peninsula and Western Alaska physiographic provinces of the Intermontane Uplands and Lowlands System (Wahrhaftig 1965). The terrain near the coast of Norton Sound consists of rolling hills and broad valleys. Rounded, low mountains appear further inland. Narrow flood plains border the many clear water streams in the area. In a number of places along the coast of Norton Sound are narrow, nearly level coastal plains. Elevation ranges from sea level to about 3,900 feet (1,198 meters).

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Northwest Alaska (1902), 100 percent. All of the area drains into Norton Sound and the Bering Sea, by way of numerous short streams and rivers originating in the mountain uplands. Principal rivers are the Unalakleet, Koyuk, and Fish Rivers. Lakes make up less than 1 percent of the area.

The area is in the zone of discontinuous permafrost. Permafrost is common on coastal plains, gently sloping footslopes, and swales on hills and mountains. Permafrost is generally absent on flood plains and in proximity to lakes and other bodies of water. In the mountains, isolated masses of permafrost are in areas of deep unconsolidated deposits. In the vicinity of Nome, the base of the permafrost has been measured to a depth of 121 feet (37 meters).

Geology

Large areas of the Seward Peninsula were glaciated during the early and middle Pleistocene epoch. By the late Pleistocene, glacial ice was limited to upper elevations. Much of the MLRA is mantled in fine to coarse mountain colluvium and alluvium. Moderate to highly modified glacial moraines and drift and scattered glaciofluvial deposits are still in glaciated areas. Holocene deposits fill most areas of coastal lowlands. Recent fluvial deposits are on flood plains and stream terraces. Bedrock geology of the area is predominantly Cretaceous, Precambrian and Paleozoic stratified sedimentary rocks and Cretaceous through Tertiary volcanic rocks. Many coastal areas, and the lower elevations of hills and mountains, are mantled with a thin layer of silty eolian deposits of Holocene age.

Climate

The climate of the area is maritime much of the year and strongly continental in winter when the Bering Sea ice pack has formed. Orographic effects and other mountainous influences are significant at higher elevations. Summers are brief and cool. Winters are long and cold. Cloudy and windy conditions are common throughout the year. At lower elevations, the average annual precipitation is about 15 to 20 inches (381 to 508 millimeters). At higher elevations, the average annual precipitation is 20 to 40 inches (508 to 1,016 millimeters). The majority of precipitation falls

as rain in late summer. The average annual snowfall is 40 to about 100 inches (102 to 254 centimeters). The average annual temperature along the coast is about 26 degrees F (-3.3 degrees C). The average frost-free period along the coast is about 55 to 90 days.

Soils

The approximate extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 56 percent; Inceptisols, 29 percent; Entisols, 7 percent; other soil orders, 3 percent; and miscellaneous (nonsoil) areas, 5 percent. Area soils have a pergelic or cryic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. Mollorthels, Aquiturbels, and Histoturbels are common on mountains, hills, and coastal plains. On mountains and hills, these soils are formed in loamy and gravelly colluvium. Many are moderately deep to deep over fractured bedrock. On coastal plains, these soils are formed in mixed loamy and gravelly colluvium and slope alluvium. Histoturbels and Aquiturbels have a moderately thick, sometimes discontinuous, surface layer of organic material. Gelisols in this area are shallow to moderately deep over permafrost and poorly drained or somewhat poorly drained. On steep mountain slopes, particularly at upper elevations, Dystrochrepts and Eutrocryepts form in gravelly colluvium over fractured bedrock. These soils are shallow to deep over bedrock and are well drained. Soils on flood plains include Cryofluvents and Cryorthents formed in stratified loamy over sandy and gravelly alluvium. These soils are deep and range from somewhat poorly drained to well drained. Common miscellaneous areas include surface bedrock, rubble, talus, and beaches.

Biological Resources

On low and middle elevation mountain slopes with well drained soils, the predominant vegetation is tall alder shrub, tall and low willow scrub, and low ericaceous shrub scrub. On peatlands and moderately well drained mineral soils, low ericaceous shrub and shrub birch scrub occur, with tussock forming sedges or various sedges and grasses in the ground layer. In drainages are wet sedge meadows, sedge-grass meadows, and sedge-moss meadows. At lower elevations, on well drained soils in valley bottoms there are open forests and woodland of mixed spruce and paper birch. The common vegetation at higher elevations and on shallow soils on convex mountain slopes and ridges, is dwarf alpine scrub dominated by ericaceous shrubs, dryas, and dwarf willows. These communities often have considerable lichen cover and bare ground. Dominating the highest elevations and ridges are bedrock exposures with scattered shrubs and herbs in pockets of fine earth and lichens.

Common mammals in the area include brown bear, caribou, moose, wolf, and a variety of furbearers. Golden eagles inhabit upper elevation areas and nest in cliffs and other protected sites. Tundra swans and a variety of other waterfowl nest in area wetlands and ponds. Coastal areas are inhabited by ribbon seals and walrus. The Unalakleet and other rivers support summer runs of pink salmon.

Land Use

This remote area is used primarily for subsistence hunting, fishing, and gathering and, on the Seward Peninsula, reindeer herding. Mining, primarily placer mining and dredge mining, was once a major land use and played an important role in the growth and development of Nome. A number of mines throughout the area continue to operate.

The major soil resource management concern is disturbance of the fragile permafrost soils. Disturbance of the insulating organic surface results in thawing of upper soil layers. This can result in ponding, soil subsidence, erosion, and disruption of surface drainage. All activities must consider the protection of the organic surface and the thermal balance of the soils.

Y—Northern Alaska Region

This region is in Alaska. It includes the northern slope of the Brooks Range, the western Brooks Range and the northern and western Seward Peninsula. Except for the western Seward Peninsula, the area drains to the north and west into the Arctic Ocean and Chukchi Sea. The western Seward Peninsula drains into the northern Bering Sea (*Figure* 1). The majority of the region is above the Arctic Circle, and consequently receives several weeks of continuous sunlight in summer and several weeks of continuous darkness in winter. This area is in the zone of continuous permafrost. Permafrost is shallow to moderately deep except on steep, coarse-textured soils in the high mountains. Periglacial features such as patterned ground, pingos, beaded drainages, and gelifluction lobes, are common throughout. Elevation ranges from sea level, on the coast, to 8,570 feet (2,612 meters), at the summit of Mt. Igikpak in the Brooks Range. The region makes up 32,539,800 square kilometers).

Reindeer grazing, wildlife habitat, mineral and petroleum extraction, and subsistence hunting, fishing, and gathering are the major land uses of this region. The arctic climate is dry and cold, characterized by very short summers and long winters. The mean annual precipitation ranges from about 4 to 10 inches (102 to 254 millimeters), at lower elevations in the north and west, to 30 to 40 inches (762 to 1,016 millimeters), at higher elevations in the Brooks Range and on the Seward Peninsula. The annual temperature ranges from 8 to 22 degrees F (-13.3 to -5.6 degrees C. Freezing temperatures can occur in any month.

The region consists of mountains, foothills, and extensive coastal plains and deltas. The north flanks of the Brooks Range consist of folded and faulted strata uplifted during the Cretaceous

period. The mountains were extensively glaciated during the Pleistocene epoch. To the north, the rolling hills, ridges, and plateaus extend to the gently rolling to level, unglaciated Arctic Coastal Plain. The southwest portion of the region, extending into the Seward Peninsula, contains flood plains, rolling lowlands, and mountains. Gelifluction lobes and patterned ground are on many landforms and provide evidence of periglacial processes.

Most soils in the region are Gelisols, having permafrost within the profile. Orthels and Turbels are the dominant suborders and occur across all landforms. Aquorthels and Histoturbels are on the gentler slopes and on poorly drained hillsides. Glacic subgroups occur near the coasts. Mollorthels are on some well drained south-facing slopes and Psammorthels are on dunes. Fibristels formed in deep organic deposits in depressions throughout the region. On some steep slopes are coarse-textured Cryepts and Orthents, with a mean annual soil temperature below 32 degrees F (0 degrees C) but without permafrost in the soil profile.

The native vegetation on foothills and lowlands is arctic tundra with grasses, sedges, mosses, lichens, ericaceous shrubs, and willows. Mountainous areas are dominantly alpine tundra with dwarf scrub communities. Here, sedges and lichens dominate the ground cover. Forested communities occur along the lower Noatak and Kobuk Rivers in the western part of the region.

241—Seward Peninsula Highlands

Introduction

MLRA 241 is in the Northern Region of Alaska and includes the broad, rolling uplands and isolated high, rugged mountains of the central Seward Peninsula, from Cape Prince of Wales east to the Selawik Hills. This MLRA makes up about 3,524,677 square kilometers). The majority of this MLRA is undeveloped wildlands and is sparsely populated. Teller, Wales, and a number of smaller villages are located in the west along the coast of the Bering and Chukchi Seas. Three roads, originating in Nome in the Nulato Hills-Southern Seward Peninsula Highlands (MLRA 240) to the south, provide access to small portions of the area. Federally administered land within this MLRA includes part of the Bering Land Bridge National Preserve.

Physiography

This area lies primarily within the Seward Peninsula physiographic province. The eastern portion is within the Western Alaska province. Both are within the Intermontane Uplands and Lowlands system (Wahrhaftig 1965). The terrain consists of extensive rolling hills, intervening lowlands, and isolated groups of rugged, moderately high mountains. Along rivers are narrow flood plains and stream terraces. Elevation ranges from sea level, along the coast, to 4,714 feet (1,437 meters), at the summit of Mt. Osborn in the Kigluaik Mountains.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Northwest Alaska (1905), 100 percent. The northern portion of this MLRA is drained into Kotzebue Sound and the Chukchi Sea by numerous, relatively short rivers. Major rivers include the Buckland, Kiwalik, and Serpentine Rivers. The western portion drains to the west into the northern Bering Sea. The principal rivers in this portion of the area are the Agiapuk-American, Kougarok, and Kuzitrin Rivers. Lakes make up less than 2 percent of the area.

The area is in the zone of continuous permafrost. Moderately thick permafrost is common in most unconsolidated materials, except along flood plains and in close proximity to lakes. Periglacial features are common. Bedrock structures have altiplanation terraces. Unconsolidated materials in uplands have gelifluction sheets, benches, lobes, and high-center polygons. Wet lowlands have low-center polygons, thermokarst pits, thaw lakes, and pingos. Massive ice wedges and lenses occur throughout the area.

Geology

During the late Pleistocene epoch, this area was mostly unglaciated. The York Mountains in the west, the Kigluaik and Bendeleben Mountains along the southern edge, and the upper Kiwalik River drainage were glaciated in the early and middle Pleistocene. The modern landscape is mantled with coarse to fine colluvium, slope alluvium, and silty loess. Bedrock is at or near the surface in many upland areas. Recent alluvial and coastal sediments occur along rivers and near the coast. Lightly to highly modified glacial moraines and drift are in glaciated areas. Bedrock geology of the area consists of a complex mixture of rock ages and types. Stratified sedimentary rocks, ranging in age from Quaternary to Precambrian, are the dominant rock types. Tertiary or Quaternary volcanic rocks and inclusions of Cretaceous and Tertiary igneous rocks are scattered throughout the area.

Climate

Brief cool summers and long, very cold winters characterize the arctic continental climate across much of the area. In summer, maritime conditions prevail along the coast of the Bering Sea. Strong winds are common throughout the area. The average annual precipitation ranges from about 10 to 15 inches (254 to 381 millimeters), in the north and west, to 20 to 40 inches (508 to 1,016

millimeters), in the mountains to the south and east. The average annual snowfall is about 40 to 100 inches (102 to 254 centimeters). Exposed, wind-blown ridges are generally free of snow. The average annual temperature at Wales is 21 degrees F (-6.1 degrees C). The average frost-free period at Wales is about 45 to 75 days. Freezing temperatures can occur in any month of the year, particularly inland and at higher elevations.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 64 percent; Entisols, 15 percent; Inceptisols, 14 percent; other soil orders, 2 percent; and miscellaneous (nonsoil) areas, 5 percent. Area soils have a pergelic or cryic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. Histoturbels, Aquiturbels, Haplorthels, and Mollorthels on elongated toeslopes adjacent to coastal areas, broad interior uplands and hills, and mountain slopes are formed in colluvium and slope alluvium. These soils are shallow to moderately deep over permafrost and poorly drained or very poorly drained. On some steep hillslopes and ridges are moderately well drained Eutrocryepts, Dystrocrepts, and Cryorthents. These soils lack permafrost within the soil profile. Fibristels on plains and in depressions, basins, and drainageways are formed in thick organic deposits. Mineral soil material, if present in these organic soils, is generally within the permafrost layer. Fibristels are shallow over permafrost and very poorly drained. Cryofluvents on flood plains and stream terraces are formed in sandy to gravelly alluvium. The soils generally lack permafrost within the soil profile and range from poorly drained to excessively drained. Common miscellaneous areas include bedrock exposures, rock outcrops, cliffs, riverwash, and water.

Biological Resources

The predominant vegetation on uplands is dwarf scrub dominated by dryas, black crowberry, ericaceous shrubs, and dwarf willow. On thin rocky soils and exposed sites, lichens and scattered herbs dominate the ground layer. Bare soil and bedrock is generally extensive. On more mesic sites, sedges, forbs, and mosses cover most of the ground surface. The predominant vegetation at lower elevations and on deeper soils on nearly level uplands and basins consists of low willow and ericaceous shrub scrub and mesic graminoid herbaceous communities, often with extensive areas of tussock forming sedges. In depressions, drainageways, and other saturated sites are wet sedge meadows and wet sedge-moss meadows. On flood plains, vegetation consists of a mix of tall and low scrub dominated by various willows, shrub birch, and alder.

Common mammals in the area include brown bear, caribou, moose, musk ox, black bear, wolf, red fox, and a variety of other furbearers and rodents. Reindeer were introduced to the area in the early 1900s to provide industry for local native residents. Many species of migratory waterfowl and shorebirds nest in areas of wet tundra. Raptors in the area include gyrfalcon, peregrine falcon, golden eagle, and a number of other hawks and owls.

Land Use

This remote area is used primarily for reindeer herding and subsistence hunting, fishing, and gathering. Reindeer provide meat for local and regional use and a number of other products for local use and export. Several highly mineralized areas have the potential for mining. Most of the mining to date has been placer mining for gold. The largest mine is the Lost River Tin Mine, which has not operated since the 1960’s. A number of mines throughout the area are still operating.

The major soil resource management concern is disturbance of the fragile permafrost soils. Disturbance of the insulating organic surface results in thawing of upper soil layers. This can result in ponding, soil subsidence, erosion, and disruption of surface drainage. All activities must consider the protection of the organic surface and the thermal balance of the soils.

242—Northern Seward Peninsula-Selawik Lowlands

Introduction

MLRA 242 is in the Northern Region of Alaska and includes the mosaic of coastal lowlands, river deltas, gently sloping uplands, and isolated hills and low mountains along the northern Seward Peninsula and in the lower Selawik basin at the head of Kotzebue Sound. To the east, the area extends to the lower slopes of the Purcell Mountains, Zane Hills, and Sheklukshuk Range. This MLRA makes up 2,056,295 square kilometers. The area is mostly undeveloped wildlands and is sparsely populated. There are a number of villages scattered throughout this MLRA, the largest of which are Noorvik, Kotzebue, and Shismaref. Federally administered lands within this MLRA include parts of the Bering Land Bridge National Preserve, a major portion of Selawik National Wildlife Refuge, and a small unit of the Alaska Maritime National Wildlife Refuge.

Physiography

This area lies primarily within the Seward Peninsula physiographic province. The eastern portion is within the Western Alaska province. Both are within the Intermontane Uplands and Lowlands division (Wahrhaftig 1965). The terrain consists of nearly level to rolling plains, river deltas, and extended mountain footslopes. Depressions and shallow basins are dotted with hundreds of small lakes and interconnecting wetlands. Along rivers are nearly level, meandering flood plains. In a few locations, the landscape is broken by rounded, low relief hills protruding above the surrounding lowlands. In general, elevation ranges from sea level, in the coastal lowlands, to about 300 feet (91 meters), near the adjacent mountainous areas.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Northwest Alaska Region (1902), 100 percent. The entire area drains into Kotzebue Sound and the Chukchi Sea. Major river systems that traverse the area include the Selawik and Buckland Rivers and the Kobuk and Noatak River deltas. Lakes make up about 25 percent of the area.

The area is in the zone of continuous permafrost. Permafrost is thin to moderately thick and primarily in fine textured deposits. Maximum depth to the bottom of the permafrost near Kotzebue is as much as about 240 feet (72 meters). Permafrost is generally absent on flood plains and in proximity to lakes and other bodies of water. Periglacial features, such as beaded drainages, patterned ground, thaw gullies, pingos, and frost boils occur throughout the area.

Geology

The western portion of the area was unglaciated during the Pleistocene epoch. Most of the eastern portion of the area was covered by glacial ice originating in the Waring Mountains and Brooks Range to the north. Sediments across the vast majority of the area consist of fine textured, Holocene and Pleistocene deltaic and fluvial deposits in coastal lowlands, Holocene fluvial deposits on flood plains and stream terraces, and mixed colluvium and slope alluvium on mountain footslopes. Underlying bedrock geology consists primarily of stratified sedimentary rocks and volcanic rocks of Cretaceous, Tertiary, and Quaternary age.

Climate

Brief cool summers and long very cold winters characterize the climate of this area. In summer, maritime conditions prevail near the coast becoming more continental further inland. In winter when the ice pack forms on Kotzebue Sound, arctic continental conditions prevail throughout the area. The average annual precipitation ranges from less than 10 inches (254 millimeters), in coastal

lowland areas, to 20 to 30 inches (508 to 762 millimeters), in the hills and mountains in the south and east. The average annual snowfall is about 40 to 60 inches (102 to 152 centimeters). The average annual temperature at Kotzebue is 22 degrees F (-5.6 degrees C). The average frost-free period at Kotzebue is about 75 to 95 days. Freezing temperatures can occur in any month of the year, particularly in inland areas at higher elevations.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 64 percent; Inceptisols, 4 percent; Entisols, 3 percent; other soil orders, 2 percent; and miscellaneous (nonsoil) areas, 25 percent. Area soils have a pergelic soil temperature regime, most have an aquic soil moisture regime, and mixed mineralogy. Fibristels, Histoturbels, and Aquiturbels are the common soils on coastal lowlands and deltas. Fibristels in depressions and shallow basins are formed in thick organic materials over shallow to moderately deep permafrost. Mineral soil material, if present in these organic soils, is usually within the permafrost layer. Fibristels are very poorly drained. Histoturbels and Aquiturbels on elevated and convex positions, low terraces, and long footslopes are formed in silty and sandy material over gravelly substratam. Histoturbels have a moderately thick surface layer of organic material. Histoturbels and Aquiturbels are shallow to moderately deep to permafrost, often have surface microtopography of polygons and stripe hummocks, and are generally poorly drained or very poorly drained. Dystocryepts and Eutrocryepts on hills and elevated ridges also are formed in silty and sandy fluvial sediments. These soils lack permafrost within the soil profile and are usually well drained or moderately well drained. Cryorthents, Cryaquents, and Cryofluvents on flood plains and stream terraces are formed in silty and sandy alluvium. Cryopsamments on coastal dunes are formed in deep deposits of sand. These Entisols, which lack permafrost within the soil profile, range from very poorly drained to excessively drained. Common miscellaneous areas include water, tidal flats, and beaches.

Biological Resources

Lakes and ponds and saturated soils are present throughout the majority of the area. Vegetation adjacent to lakes and ponds and where surface water is generally present include wet sedge meadows, sedge-shrub meadows, and sedge-moss meadows. On peat mounds and other low uplands are low and dwarf scrub dominated by ericaceous shrubs, sedges, and other hydrophytic plants, and mosses. Sites with better drainage and areas of higher local relief support low ericaceous shrub scrub with common mosses, lichens, low willows, and forbs. Dense stands of grasses grow on beds of drained thaw lakes. On flood plains are low and tall willow scrub and alder scrub. In the eastern portion of the area, spruce forests and woodland occur on well drained flood plains and better drained uplands. Both white and black spruce are common. Low ericaceous shrubs, willow, alder, and mosses are dominant in the understory.

Common area mammals include brown bear, wolf, caribou, and various furbearers. Walrus and seals are in some coastal areas. The majority of this area contains good quality waterfowl habitat. Every year thousands of swans, geese, and ducks use the lowlands as a staging and nesting area. Sandhill cranes and a variety of shore and passerine birds nest throughout the area.

Land Use

Local residents use this remote area primarily for subsistence hunting, fishing, and gathering.

The major soil resource management concern is disturbance of the fragile permafrost soils. Disturbance of the insulating organic surface results in thawing of upper soil layers. This can result in ponding, soil subsidence, erosion, and disruption of surface drainage. All activities must consider the protection of the organic surface and the thermal balance of the soils.

243—Western Brooks Range Mountains, Foothills, and Valleys

Introduction

MLRA 243 is in the Northern Region of Alaska and encompasses the southern slopes of the DeLong Mountains, the Baird Mountains, the Noatak River drainage, and the lower Kobuk River drainage. The southern limit of the area includes the western Lockwood Hills, Sheklukshuk and Waring Mountains, and Kiana and Igichuk Hills. The Kobuk and Noatak River deltas are included in the Northern Seward Peninsula-Selawik Lowlands (MLRA 238). This MLRA makes up 5,984,203 square kilometers. The area is mostly undeveloped wildlands and is sparsely populated. The village of Noatak, along the lower Noatak River, and Ambler and Shugnak, along the lower Kobuk River, are the principal permanent settlements in the area. Federally administered lands within this MLRA include parts of Gates of the Arctic National Park and Preserve, Noatak National Preserve, Kobuk Valley National Park, and Cape Krusenstern National Monument.

Physiography

This area lies within the Arctic Mountains physiographic province of the Rocky Mountain system (Wahrhaftig 1965). The terrain consists of a complex of flood plains, stream terraces, and rolling hills and upland slopes along the Noatak River and lower Kobuk River. These features quickly give rise to moderately steep foothills and lower mountain slopes eventually leading to steep, rugged, high relief mountains. Upper mountain slopes are generally rocky with extensive surface bedrock and rock rubble. Small glaciers and permanent snowfields are at the heads of some high elevation valleys. Broad flood plains and extended mountain footslopes along the Kobuk, Squirrel, Ambler, and lower Noatak Rivers are dotted with numerous small and medium-sized lakes and interconnecting wetlands. Elevation ranges from about 20 feet (6 meters), along the lower Noatak in the west, to 8,570 feet (2,612 meters), at the summit of Mt. Igikpak in the east.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Northwest Alaska (1902), 100 percent. The majority of the area drains, via numerous rivers, into the Noatak River. The south slopes of the Baird Mountains drain into the Squirrel River, Ambler River, and other tributaries of the Kobuk River. Both the Noatak and Kobuk Rivers empty into Kotzebue Sound and the Chukchi Sea. Lakes make up about 3 percent of the area.

This area is in the zone of continuous permafrost. In the mountains, permafrost is most evident in unconsolidated materials. In the valleys, thick permafrost occurs in both fine and coarse textured materials. Depth to the base of the permafrost may be 1,000 feet (305 meters) or more. In close proximity to water bodies, depth to the base may be 600 feet (183 meters) or more. Periglacial features such as pingos, thermokarst pits, thaw lakes, gelifluction lobes, and high- and low-center polygons are common on stream terraces, lower mountains slopes, and swales on foothills.

Geology

The entire area was glaciated during the early to middle Pleistocene epoch, except for possibly small portions of the Baird Mountains. By the late Pleistocene, glaciers had retreated from most of the area except the central, upper elevation portions of the DeLong Mountains in the north. The upper Noatak valley likely was covered by extensive proglacial lakes during parts of the Pleistocene epoch. In the mountains, glacial deposits have eroded away or been buried by mountain colluvium and alluvium, which accumulated during the Holocene epoch across about 60 percent of the present landscape. Lightly to highly modified glacial moraines, drift, and outwash deposits are extensive on lower mountain slopes and in valleys at mid and lower elevations. These deposits cover about 18 percent of the area. Flood plains, stream terraces, and alluvial fans have recent and

Pleistocene fluvial deposits. Underlying bedrock geology consists almost entirely of stratified sedimentary rocks of Paleozoic and Precambrian age and some of Cretaceous age.

Climate

Short, generally cool, summers and long, very cold winters characterized the arctic climate of this area. The average annual precipitation ranges from about 10 to 15 inches (254 to 381 millimeters), at lower elevations in the west and along the central Noatak River, to about 20 to 40 inches in the mountains. The average annual snowfall is about 35 to 100 inches (89 to 254 centimeters). The average annual temperature ranges from about 8 to 16 degrees F (-13 to -9 degrees C). The length of the frost-free period is not known. Snow and freezing temperatures can occur in any month of the year, particularly at higher elevations.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 54 percent; Entisols, 7 percent; Inceptisols, 5 percent; Mollisols, 5 percent; other soil orders, 2 percent; and miscellaneous (nonsoil) areas, 27 percent. Area soils have a pergelic or cryic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. Histoturbels, Aquiturbels, and Haploturbels are formed in loamy to gravelly and stony colluvium, slope alluvium, and glacial drift on slopes, ridges, and fans in mountains; on foothills, long upland slopes, and high terraces; and on flats in valleys. Histoturbels have a moderately thick surface layer of organic material. On upper mountain slopes and ridges, these soils are usually shallow to deep over fractured bedrock. These Gelisols are shallow to moderately deep over permafrost and poorly drained or very poorly drained. Fibristels in depressions, shallow basins, and along lake margins are formed in deep organic material. These soils are shallow to moderately deep over permafrost and very poorly drained to somewhat poorly drained. Cryorthents, Dystrocryepts, Eutrocryepts, and Haplocryolls on upper mountain slopes and ridges are formed in loamy to stony colluvium and residuum. These soils are shallow to deep and generally well drained. Cryofluvents on flood plains are formed in stratified loamy, sandy, and gravelly alluvium and are well drained. Common miscellaneous areas include rock outcrops, rubble fields, escarpments, and water.

Biological Resources

The predominant vegetation on mountain slopes and ridges is dwarf scrub dominated by dryas, black crowberry, ericaceous shrubs, and dwarf willow. On thin rocky soils and exposed sites, lichens and scattered herbs dominate the ground layer. Bare soil and bedrock is generally extensive. On more mesic sites, sedges, forbs, and mosses cover most of the ground surface. The predominant vegetation at lower elevations and on deeper soils on nearly level uplands, terraces, and basins consists of low willow and ericaceous shrub scrub and mesic graminoid herbaceous communities, often with extensive areas of tussock forming sedges. In depressions, drainageways, and other saturated sites are wet sedge meadows and wet sedge-moss meadows. On flood plains, vegetation consists of a mix of tall and low scrub dominated by various willows, shrub birch, and alder. Along the lower Noatak and Kobuk rivers, white spruce and mixed spruce-balsam poplar forests and woodland are found in association with the scrub.

Common mammals in the area include brown bear, caribou, moose, musk ox, black bear, wolf, red fox, and a variety of other furbearers and rodents. Many species of migratory waterfowl and shorebirds nest in area ponds and wetlands. Raptors in the area include gyrfalcon, peregrine falcon, golden eagle, and a number of other hawks and owls. Arctic char and Arctic grayling are in most of the rivers. Lake trout and northern pike are common in many lakes

Land Use

Local residents use this remote area primarily for subsistence hunting, fishing, and gathering. Wildland recreation and hunting are also increasingly important land uses. Most visitors are served by air taxi, guiding, and outfitting companies operating out of major Alaska communities.

244—Northern Brooks Range Mountains

Introduction

MLRA 244 is in the Northern Region of Alaska and includes the high mountains and valleys on the northern side of the Brooks Range that drain into the Colville River and other Arctic Ocean drainage basins. This MLRA makes of 4,072,958 square kilometers. The area is entirely remote wildlands and is sparsely populated. Anaktuvuk Pass, along the boundary with the Interior Brooks Range Mountains (MLRA 234), is the only village within this MLRA. The Dalton Highway (known locally as the Haul Road) and the Trans-Alaska Pipeline bisects the Brooks Range at Atigun Pass. Federally administered lands within this MLRA include parts of Gates of the Arctic National Park and Preserve, Arctic National Wildlife Refuge, and the southern extreme of the National Petroleum Reserve.

Physiography

This area lies within the Arctic Mountains physiographic province of the Rocky Mountain system (Wahrhaftig 1965). The Brooks Range is the most northerly extension of the Rocky Mountains. The terrain consists of steep, rugged, high mountains and narrow valleys. Small glaciers occur at higher elevations in some places, particularly in the Romanzof Mountains in the east. Upper mountain slopes are generally rocky with extensive surface bedrock and rock rubble. Lower slopes are characterized by coalescing fans and steep footslopes that extend to stream channels in narrow valleys. The valley bottoms of the larger rivers and streams have nearly level flood plains and stream terraces and some rolling uplands. Elevation ranges from about 1,969 feet (600 meters), along the edge of the Arctic Foothills (MLRA 245), to 8,570 feet (2,612 meters), at the summit of Mt. Igikpak in the west along the border with the adjacent Brooks Range MLRAs.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Arctic Slope (1901), 100 percent. Numerous rivers drain this MLRA through the Arctic Foothills and Coastal Plain to the Arctic Ocean. The major rivers include the Kongakut, Aichilik, Jago, Canning, Ivishak, Bibdon, Atigun, Anaktuvuk, and Killik Rivers. Lakes make up less than 2 percent of the area.

This area is in the zone of continuous permafrost. In the mountains, permafrost is most evident in areas of deep unconsolidated deposits. In valleys, thick permafrost occurs in both fine and coarse textured deposits. Periglacial features, including gelifluction lobes, polygons, and stripes are common on stream terraces, hills, and gently sloping areas in the mountains.

Geology

Except for the highest peaks, steep upper elevation ridges and occasional unglaciated valleys, most of the area was buried in glacial ice during the early and middle Pleistocene epoch. In many places, the ice extended northward down onto the adjacent Arctic Foothills (MLRA 245). By the late Pleistocene epoch, only the highest valleys and mountains remained glaciated. Most glacial deposits have eroded away or been buried by mountain colluvium and alluvium, which accumulated during the Holocene epoch across about 75 percent of the present landscape. Lightly to highly modified glacial moraines, drift, and outwash deposits are extensive on lower mountain slopes and in valleys at lower elevations. These deposits cover about 20 percent of the area. Flood plains, stream terraces, and alluvial fans have recent and Pleistocene fluvial deposits. Underlying bedrock geology consists almost entirely of stratified sedimentary rocks of Paleozoic and Precambrian age. Inclusions of Paleozoic and early Jurassic volcanic and igneous rocks are in the east.

Climate

Brief, cool summers and long, very cold winters characterize the arctic climate of this area. The average annual precipitation across most of the area ranges from 15 to 40 inches (381 to 1,016 millimeters). The average annual snowfall is about 50 to 100 inches (127 to 254 centimeters). The average annual temperature ranges from about 8 to 16 degrees F (-13 to -9 degrees C). The length of the frost-free period is not known. Freezing temperatures can occur in any month of the year.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 20 percent; other soil orders, 5 percent; and miscellaneous (nonsoil) areas, 75 percent. Gelisols in the area have a pergelic soil temperature regime, most have an aquic or udic soil moisture regime, and mixed mineralogy. Aquiturbels, Histoturbels, Molliturbels, and Haploturbels are formed in loamy to stony colluvium, slope alluvium, and residuum. These soils are shallow to moderately deep over permafrost and are poorly drained or very poorly drained. Fibristels in depressions, drainageways, and basins are formed in thick organic materials, are shallow to moderately deep over permafrost, and very poorly drained. Common miscellaneous areas include talus, rubble, bedrock exposures, outcrops, cliffs, small glaciers, and permanent snowfields.

Biological Resources

Because of the shallow soils, high winds, and harsh climate vegetation cover is sparse and generally limited to valleys and lower-mountain slopes. Dwarf scrub communities on mountain slopes and ridges are dominated by black crowberry, ericaceous shrubs, dryas, and dwarf willow. On thin rocky soils and exposed sites, lichens and scattered herbs dominate the ground layer. Bare soil and bedrock are generally extensive. On more mesic sites, sedges, forbs, and mosses cover most of the ground surface. The predominant vegetation at lower elevations and on deeper soils in basins and on terraces consists of low willow and ericaceous shrub scrub and mesic graminoid herbaceous communities, often with extensive areas of tussock forming sedges. In depressions, drainageways, and other saturated sites are wet sedge meadows, sedge-shrub meadows, and wet sedge-moss meadows. Low and tall willow scrub is the dominant vegetation on flood plains.

Common mammals in the area include brown bear, black bear, wolf, caribou and Dall sheep. Smaller mammals include marmot, red and arctic fox, wolverine, ground squirrel, lemming, and pika. Common raptors in many areas include golden eagles, marsh hawks, and snowy owls.

Land Use

Residents of nearby villages use this remote area primarily for subsistence hunting, fishing, and gathering. The area is also used widely for sport hunting and wildland recreation. Most visitors are served by air taxi, guiding, and outfitting companies operating out of major Alaska communities. Mineral resources have been prospected and mined in a number of places. Construction and maintenance of the Dalton Highway has lead to development of numerous sand and gravel pits along the road corridor.

245—Arctic Foothills

Introduction

MLRA 245 is in the Northern Region of Alaska and includes the broad, rounded hills and nearly level uplands at the base of the Brooks Range from Point Hope in the west to Demarcation Point in the east. This MLRA makes up about 10,969,368 square kilometers. The area is entirely undeveloped wildlands and is sparsely populated. The only villages include Umiat in the central part of the MLRA and Kivalina and Point Hope along the coastline of the Arctic Ocean in the west. The Dalton Highway (known locally as the Haul Road) and the Trans-Alaska Pipeline bisects this MLRA west of the Sagavanirktok River. Federally administered lands within this MLRA include parts of the National Petroleum Reserve and Arctic National Wildlife Refuge.

Physiography

This area lies within the Arctic Foothills physiographic province of the Rocky Mountain System (Wahrhaftig 1965). The northern portion consists of broad, rounded ridges and mesa-like uplands. The higher southern portion consists of irregular buttes, mesas, and long linear ridges with intervening undulating plains and plateaus. Many streams and rivers are in swales and valleys between hills. Most rivers are confined to a single, moderate gradient, slightly meandering channel. Braided sections are present across level areas. Elevation ranges from about 656 feet (200 meters), in the north along the border of the Arctic Coastal Plain (MLRA 246), to about 2,000 feet (610 meters), in the south along the border with the Northern Brooks Range Mountains (MLRA 244). Some hills bordering the Brooks Range are as high as 3,600 feet (1,100 meters).

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Arctic Slope (1901), 100 percent. Numerous rivers originating in the Brooks Range drain through the Arctic Coastal Plain to the Arctic Ocean. The major drainage is that of the Colville River. Other major rivers include the Canning and Sagavanirktok Rivers. Lakes make up less than 2 percent of the area.

The area is in the zone of continuous permafrost. Thick permafrost occurs in both fine and coarse textured deposits. The depth to the base of the permafrost is as much as 2,100 feet (660 meters). Periglacial features such as pingos, gelifluction lobes, and patterned ground occur throughout the area.

Geology

Except possibly for upper elevation areas along the edge of the Northern Brooks Range Mountains (MLRA 244), the area remained unglaciated during the Pleistocene epoch. Bedrock and coarse to fine rubble mantles the surface on convex uplands. Elsewhere, Quarternary surface deposits include various materials of alluvial, aeolian, or glaciofluvial origin. Lightly to highly modified moraines and drift occur in places adjacent to the Brooks Range. Bedrock geology of the area consists primarily of Cretaceous and late Paleozoic to lower Mesozoic stratified sedimentary rocks. These rocks make up about 67 percent of the area. The remainder of the area consists of uplifted Cretaceous and Tertiary continental deposits.

Climate

Brief cool summers and long, very cold winters characterize the arctic climate of the area. The average annual precipitation ranges from less than 10 inches (254 millimeters), at lower elevations

along the northern boundary with the Arctic Coastal Plain (MLRA 246), to 15 to 20 inches (381 to 508 millimeters), at higher elevations in the south. The average annual snowfall ranges from about 40 to 60 inches (102 to 152 centimeters). The average annual temperature ranges from 10 to 18 degrees F (-12.2 to -7.8 degrees C). The average frost-free period ranges from fewer than 10 days to 55 days.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 95 percent; Entisols, Inceptisols, and other orders less than 1 percent; and miscellaneous (nonsoil) areas, 4 percent. Area soils have a pergelic soil temperature regime, most have an aquic soil moisture regime, and mixed mineralogy. They are generally shallow to moderately deep over permafrost, poorly drained or very poorly drained, and loamy and gravelly. Aquiturbels, Histoturbels, and Molliturbels on ridges, gently sloping to steep hills, and in valley bottoms are formed in loamy and gravelly colluvium and slope alluvium. On stream terraces, these soils are formed in gravelly alluvium. On some steep hillsides are moderately well drained Eutrocryepts and Cryorthents. These soils lack permafrost within the soil profile. Fibristels in depressions, valley bottoms, and drainageways are formed in deep organic deposits. Common miscellaneous areas include rock outcrop, talus, and ice.

Biological Resources

The predominant vegetation on uplands is dwarf scrub dominated by dryas, black crowberry, ericaceous shrubs, and dwarf willow. On thin rocky soils and exposed sites, lichens and scattered herbs dominate the ground layer. Bare soil and bedrock are generally extensive. On more mesic sites, sedges, forbs, and mosses cover most of the ground surface. The predominant vegetation on mesic sites and deeper soils in valleys, basins, and terraces consists of low and dwarf willow and ericaceous shrub scrub and mesic graminoid herbaceous communities, often with extensive areas of tussock forming sedges. In depressions, drainageways, and other saturated sites are wet sedge meadows and wet sedge-moss meadows. On flood plains, vegetation consists of a mix of tall and low scrub dominated by various willows, shrub birch, and occasionally alder.

Common mammals in the area include brown bear, wolf, wolverine, caribou, arctic fox, snowshoe and tundra hare, hoary marmot, and brown and northern bog lemming. Musk oxen, which were decimated by hunting in the late 1800s, are becoming more common in many places. Birds common to the area include willow ptarmigan, rough-legged hawk, American golden plover, short-eared owl, and snowy owl. Arctic char and Arctic grayling are in most of the rivers.

Land Use

Local residents use this area primarily for subsistence hunting, fishing, and gathering. Sport hunting and other wildland recreation are becoming increasingly important land uses. Most visitors are served by air taxi, guiding, and outfitting companies operating out of major Alaska communities. Limited mineral extraction, including oil and gas, occurs in localized areas.

The major soil resource management concern is disturbance of the fragile permafrost soils. Disturbance of the insulating organic surface results in thawing of upper soil layers. This can result in ponding, soil subsidence, erosion, and disruption of surface drainage. All activities must consider the protection of the organic surface and the thermal balance of the soils.

246—Arctic Coastal Plain

Introduction

MLRA 246 is in the Northern Region of Alaska and consists of level to gently rolling plains along the coast of the Arctic Ocean. This MLRA makes up about 5,932,299 square kilometers. This MLRA is mostly remote wildlands and is sparsely populated. Permanent settlements include Pt. Lay, Wainwright, Barrow, Nuigsut, and Kaktovik. The Prudhoe Bay oil fields and the northern terminus of the Trans-Alaska Pipeline are located in the central portion of the area. The Dalton Highway (known locally as the Haul Road) and the Trans-Alaska Pipeline bisects the area west of the Sagavanirktok River, terminating at Deadhorse. The community of Deadhorse provides much of the industrial infrastructure and residential facilities associated with the oil fields and pipeline. Federally administered lands with this MLRA include parts of the National Petroleum Reserve and Arctic National Wildlife Refuge.

Physiography

This area lies within the Arctic Coastal Plain physiographic province of the Interior Plains system (Wahrhaftig 1965). The terrain consists of a level to gently rolling plain rising from the Arctic Ocean to the Arctic Foothills (MLRA 245). The area is dotted by thousands of small to medium-sized lakes and interconnecting wetlands. Many of the lakes are elongated thaw lakes, which are consistently oriented north-northwest. Along the many rivers that cross the area are narrow, nearly level flood plains and stream terraces. In the central part of the area near the coast, small sand dunes also occur along rivers. Elevation ranges from sea level to about 656 feet (200 meters).

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Arctic Slope (1901), 100 percent. Numerous rivers, mostly originating in the Brooks Range to the south, drain this MLRA to the Arctic Ocean. The major rivers are the Canning, Colville, Jago, Kongakut, Kuk, Utukok, and Sagavanirktok Rivers. Lakes and other surface water make up about 20 percent of the area.

The area is in the zone of continuous permafrost. Thick permafrost occurs in both fine and coarse textured deposits. The depth to the base of the permafrost is as much as 2,100 feet (660 meters). Periglacial features, such as beaded drainages, patterned ground, thaw gullies, pingos, and frost boils, occur throughout the area.

Geology

This area was never glaciated. Bedrock geology consists of Cretaceous and Tertiary stratified sedimentary rocks and uplifted continental deposits. The modern landscape is mantled with Quarternary deposits of alluvial, aeolian, or glaciofluvial origin.

Climate

Brief, cool summers and long, very cold winters characterize the arctic climate of this area. The average annual precipitation is 4 to 6 inches (102 to 152 millimeters). The average annual snowfall is about 20 to 40 inches (51 to 102 centimeters). The average annual temperature ranges from 8 to 14 degrees F (-15 to -10 degrees C). The average frost-free period ranges from fewer than 5 days to 20 days. Freezing temperatures can occur in any month.

Soils

The extent of the soil orders and nonsoil areas in this MLRA is as follows: Gelisols, 80 percent; and miscellaneous (nonsoil) areas, 20 percent. The soils in the area have a pergelic soil temperature regime, most have an aquic soil moisture regime, and mixed mineralogy. All of the soils contain permafrost. They are generally shallow to moderately deep over permafrost and poorly drained or very poorly drained. Aquiturbels, Histoturbels, and Haploturbels on nearly level to rolling plains, low hills, and pingos are formed in loamy to gravelly sediments. Aquiturbels and Haplorthels on floodplains and stream terraces are formed in sandy and gravelly alluvium. Psammoturbels on dunes, with Aquiturbels in the interdune areas, are formed in deep sandy deposits. Fibristels in depressions, basins, drainageways, and along lake margins are formed in deep organic deposits. Common miscellaneous areas include water, riverwash, tidal flats, and beaches.

Biological Resources

Wet soil conditions are prevalent across much of the area. Vegetation consists primarily of a variety of mesic and wet sedge, sedge-grass, and sedge-moss meadows. On drier sites and low uplands the vegetation consists of dwarf scrub dominated by dryas, black crowberry, ericaceous shrubs, and dwarf willow. On thin rocky soils and exposed sites, lichens and scattered herbs dominate the ground layer. Bare soil and bedrock is generally extensive. On flood plains, vegetation consists of a mix of low willow scrub and scattered herbs.

Common mammals in the area include brown bear, wolf, wolverine, caribou, arctic hare, mink, weasel, and lemming. Decimated by hunting in the late 1800's and reintroduced to the area in 1969, small herds of musk oxen are scattered throughout the area. Pack ice and coastal areas are home to polar bear, walrus, and arctic fox. Many species of migratory waterfowl nest in the lakes and ponds of the area, including lesser snow geese, tundra swans, brant, and common eider. Seabirds are abundant along the coast, and include the pomarine jaeger, glaucous gull, and black guillemot. A wide variety of passerine birds and shorebirds utilize upland and wetland habitats throughout the area.

Land Use

Local residents use this area primarily for subsistence hunting, fishing, and gathering. Sport hunting and other wildland recreation are becoming increasingly important land uses. Most visitors are served by air taxi, guiding, and outfitting companies operating out of major Alaska communities. Oil and gas extraction and related infrastructure occurs in concentrated areas.

The major soil resource management concern is disturbance of the fragile permafrost soils. Disturbance of the insulating organic surface results in thawing of upper soil layers. This can result in ponding, soil subsidence, erosion, and disruption of surface drainage. All activities must consider the protection of the organic surface and the thermal balance of the soils. Oil spills and other industrial pollution is a serious concern in areas of oil and industrial development.

Appendix

Mapping Methods

The updated LRRs and MLRAs for Alaska were developed using a top-down, subdivision approach. First, the state was divided into LRRs. Next, each region was subdivided into major land resource areas.

Boundaries between units at both the LRR and MLRA levels were derived primarily from existing digital data layers. LRR and MLRA descriptions were compiled from existing statewide data sources and the field experience of the Alaska soil survey staff. Existing data layers and other sources used in establishing boundaries and compiling descriptions included:

- Bedrock geology (The 1980 Geologic Map of Alaska compiled by H.M. Beikman and published by the USGS as a Special Map at 1:2,500,000)
- Surficial geology (A surficial geology of Alaska, compiled by N.V. Karlstrom, et.at. 1964 and published by the USGS as a Miscellaneous Geologic Investigations Map I-357 at 1:1,584,000)
- Physiographic Divisions of Alaska (USGS Professional Paper 482)
- Permafrost (Permafrost map of Alaska. By O.J. Ferrians, 1965, U.S. Geological Survey Miscellaneous Geologic Investigations Map 1-445)
- Exploratory Soil Survey of Alaska (STATSGO data level) (USDA NRCS Alaska)
- Available Alaska soil surveys (SSURGO data level) (USDA NRCS Alaska)
- Statewide vegetation/land cover (Vegetation map of Alaska, 23 classes, 19 vegetated, raster format. The classification was developed by Michael Fleming using the phenology of a vegetation index (AVHRR/NDVI) collected during the 1991 growing season)
- Prism climatic data
- Digital elevation models

Land Resource Regions

The primary digital data layer used to develop the initial LRR delineations was the 8-digit hydrologic unit map (Lamke and others 1995). Each 8-digit hydrologic unit was reclassified and placed in a land resource region based on geographic location and general characteristics of regional climate (maritime vs. continental; temperate vs. sub arctic vs. arctic). Occasionally, an 8-digit hydrologic unit would cross two climate regions and the hydrologic unit had to be split, with each portion being placed in the appropriate region. For example, unit 19020501 (upper Susitna River drainage) was split into the Interior LRR (that portion above Devil's Canyon) and the Southern LRR. During development of the major land resource areas, other minor adjustments were made to the LRR boundaries in situations where a prominent physiographic break crossed a hydrologic unit. Most such adjustments occurred in southwest and western Alaska along the boundary between the Interior and adjacent Western and Northern Regions (*Figure* 3).

The boundaries between the Southern and adjacent Western and Interior Regions and between the Interior and Northern Regions follow the physiographic divide along the crests of the mountains. The boundary between the Western and Northern Regions on the Seward Peninsula was set to best approximate the break between the zones of discontinuous and continuous permafrost (Ferrians 1965; USDA 1979). Because there is no physiographic divide separating the Western and

Interior Regions along the courses of the Yukon, Kuskokwim, and Mulchatna Rivers, the boundary was placed at the physiographic break along the base of the Kuskokwim Mountains and Nushagak Hills. The boundary between the Southern and Aleutian Regions was set at approximately Port Moller and Stepovak Bay, based on cartographic, geographic, and ecologic considerations.

Major Land Resource Areas

After the preliminary LRR boundaries were established, preliminary MLRA delineations were created by intersecting the land resource regions with the Ecoregions of Alaska and Neighboring Territory (Unified Ecoregions) (Nowacki and others 2001). Unified Ecoregions was selected as the base data layer for delineating MLRAs for a number of reasons. First, the physiographic breaks represented by the Unified Ecoregions were consistent with one of the primary distinguishing characteristics for MLRAs. Second, Unified Ecoregions also was consistent, for the most part, to the intended level of detail and scale of the MLRA map. Third, development of Unified Ecoregions was a multi-agency effort[1] that drew on a wide range of expertise and experience and represented the best available physiographic stratification of Alaska. Fourth, Unified Ecoregions are widely accepted and used by other resource agencies within the State. Using Unified Ecoregions as a basis for the initial delineations meant that the final MLRAs would be as comparable as possible with other land classification schemes currently in use in Alaska.

The Unified Ecoregion map did not incorporate criteria or breaks between units corresponding to the LRRs[2]. As a result, the intersection with the LRRs split a number of the Unified Ecoregions into two units, primarily along the physiographic divide of major mountain ranges. For example, the Unified Ecoregions “Alaska Range” unit encompasses both the south and north sides of the Alaska Range. However, since the LRR break between the Southern and Interior Regions follows the crest of the Alaska Range, the “Alaska Range” unit was split into two MLRAs, that portion riming the Cook Inlet basin and that portion on the northern, interior side of the mountains. Splitting of Unified Ecoregion units into multiple MLRAs because of preliminary LRR breaks occurred in the Brooks Range, Kobuk drainage, Nulato Hills, Chugach Mountains, Aleutian Islands, and western Alaska Peninsula.

The intersection of the Unified Ecoregions and the initial LRRs resulted in 36 preliminary MLRAs. A number of the preliminary units were aggregated further to create the final 27 MLRAs. For example, four of the preliminary units resulting from the LRR-Unified Ecoregion intersection were aggregated into a single Interior Highlands MLRA. Similarly, four preliminary units were aggregated into a single Interior Alaska Mountains MLRA. Aggregations of this nature occurred in the Alexander Archipelago-Gulf of Alaska Coast; Southern Alaska Coastal Mountains; and Western Brooks Range Mountains, Foothills, and Valleys MLRAs.

After arriving at the final 27 major land resource areas, other boundary adjustments were made based on review and input from NRCS soils, resources, and field offices staffs and comparison with other relevant digital data layers. Adjustments were made based primarily on known soils types and surficial geologic and soil parent materials and to a lesser degree on types and patterns of landforms. Adjustments were made in the Yukon Flats Lowlands, Copper River Basin, Interior Alaska Lowlands, and Yukon-Kuskokwim Highlands MLRAs (*Figure* 2). At the same time, minor

[1] The primary purpose behind the Unified Ecoregions effort and map was to reconcile the U.S. Forest Service’s Ecoregions and Subregions of Alaska, Version 2 (Nowacki and Brock, 1995) and the USGS/EPA Ecoregions of Alaska (Gallant and others, 1995).

[2] Unified Ecoregions included two higher-level categories, generally corresponding with the Division and Province level of ECOMAP (USDA 1993). However, these levels were created by aggregating the Unified Ecoregions upward into Provinces and the Provinces into Divisions. Boundary locations for Unified Ecoregions are primarily major physiographic breaks and the regional climatic zones captured in the land resource region map are not represented in any level of the Unified Ecoregions map.

boundary adjustments were made to the LRR delineations to resolve inconsistencies between physiographic breaks and hydrologic units as described above.

Between land resource regions the pattern and texture of the landscape differs markedly. This, together with cartographic considerations associated with scale of mapping, means that not all features and properties could be delineated consistently between regions. For example, in the Interior LRR the flood plains and stream terraces of the Yukon, Tanana, and Kuskokwim Rivers are broad, extensive features and presented no cartographic limitations to delineate separately from the adjacent uplands at the MLRA level. However, in the Southern LRR the flood plains and stream terraces along the Susitna and Yentna Rivers are relatively narrow, linear features and had to be included together with the adjacent uplands in one MLRA.

Final Digitizing

NRCS GIS staff performed quality control of final LRR and MLRA maps. Along the Alaska coast, both land resource region and major land resource area boundaries were extended a number of miles seaward to eliminate inconsistencies and display problems with existing digital coastlines. To calculate actual acreage of the LRRs and MLRAs, the GIS staff clipped the maps to the detailed coastline (AK DNR 1998).

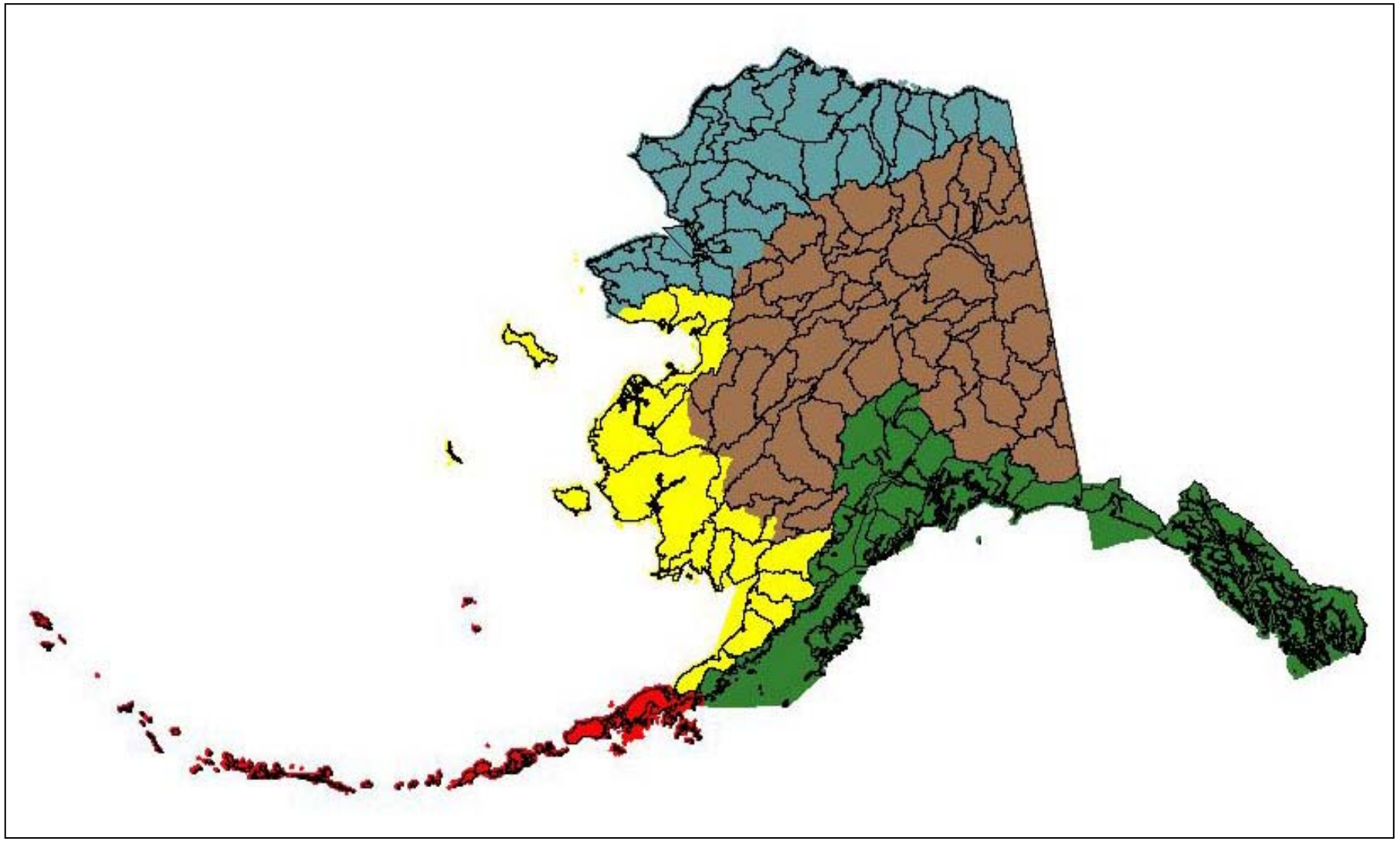

Figure 2. Comparison of final land resource regions (colored areas) with 8-digit hydrologic units (black lines).

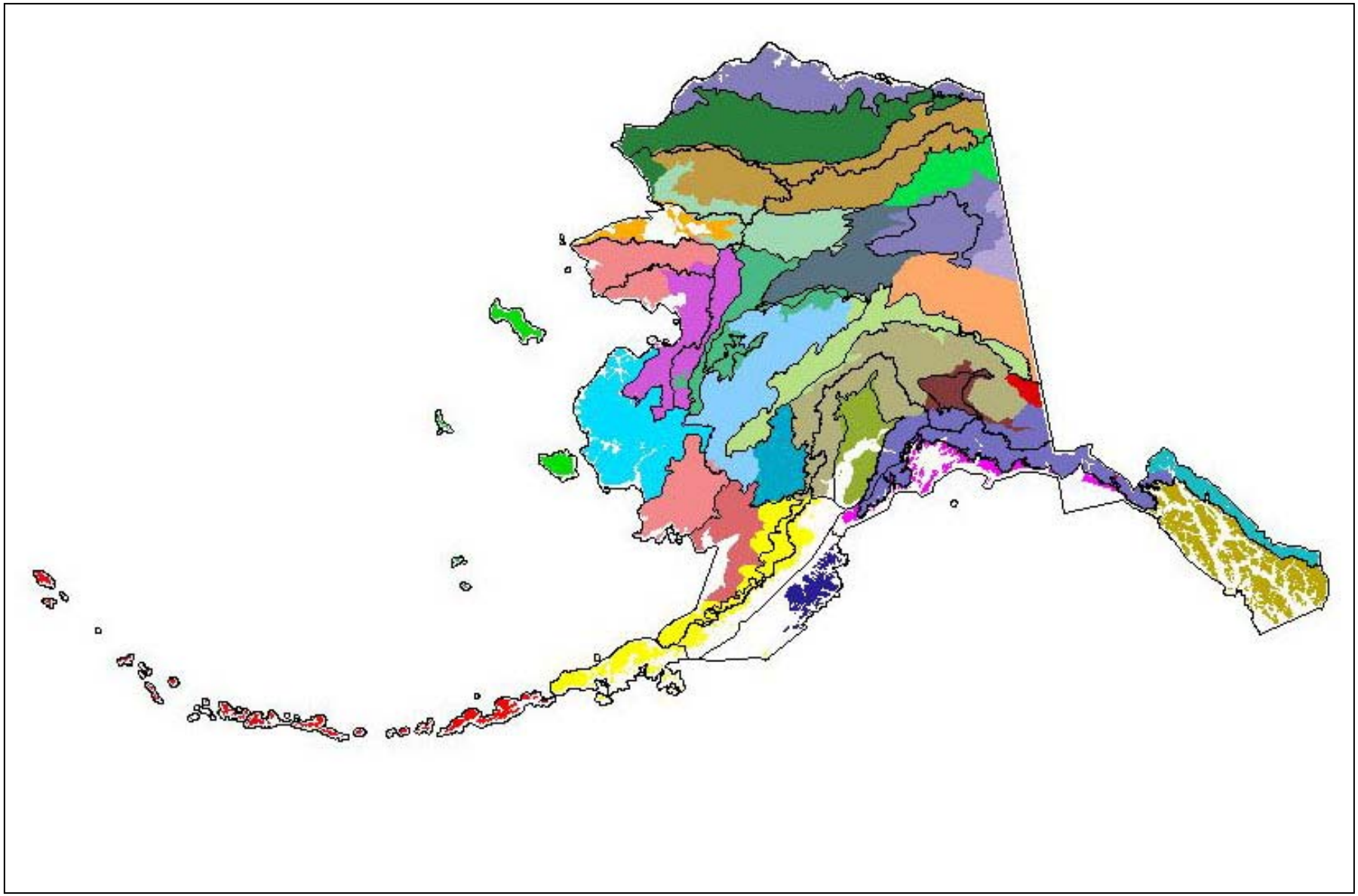

Figure 3. Comparison of final MLRAs (black lines) with Unified Ecoregions (colored areas).

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